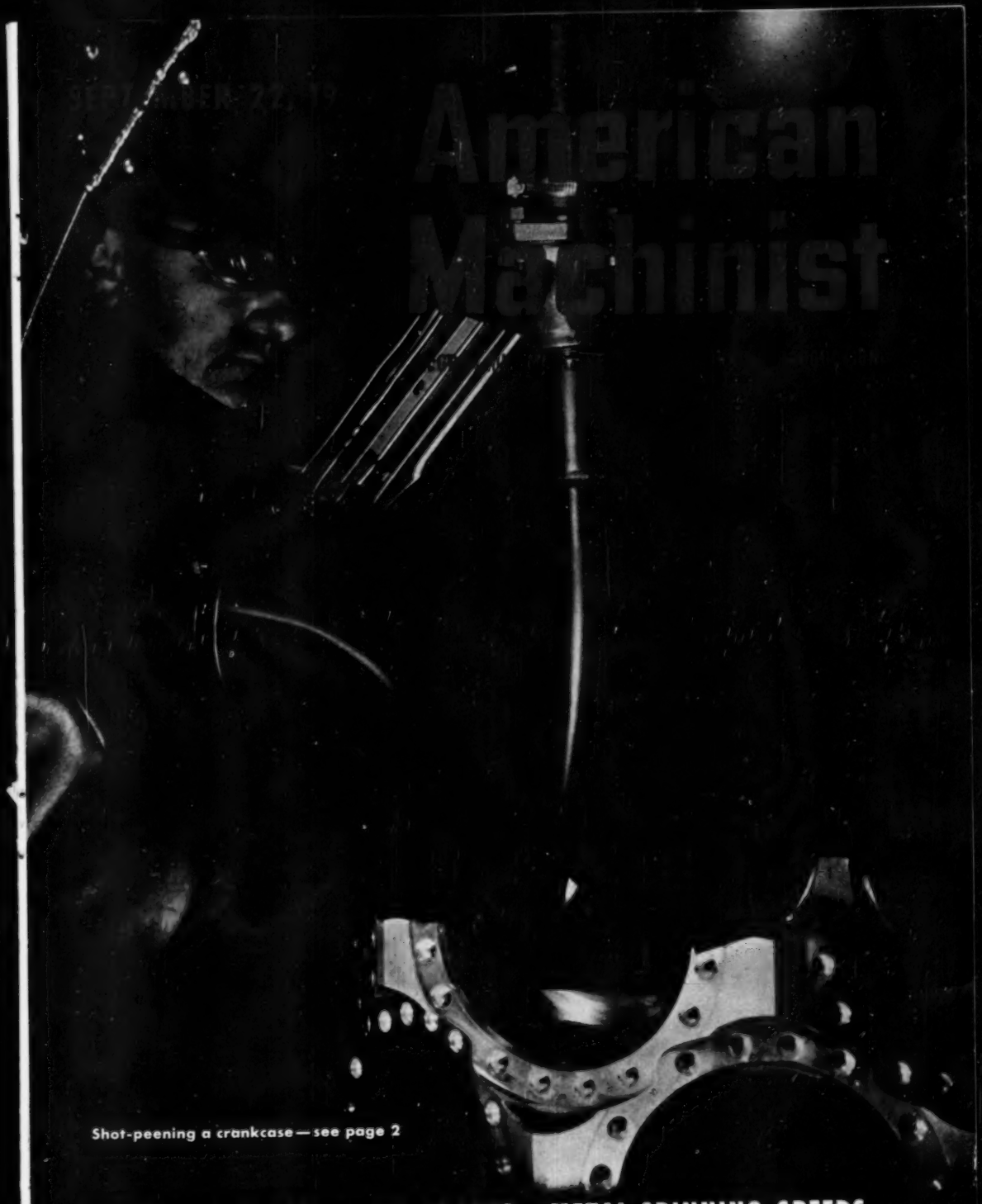
SEPTEMBER 22, 19

American Machinist



Shot-peening a crankcase—see page 2

INSPECTING JET-TURBINE BLADES • METAL SPINNING SPEEDS

A complete line of

NEW Heald Hi-Frequency RED HEADS

Give you <u>more</u> speed, economy and precision in small hole grinding

This Heald Model 180 Centerless Internal Grinder is equipped with a Hi-Frequency Red Head wheelhead, for faster, more economical grinding of small bore bearing races.

● The necessity for increasing wheel speed to obtain proper surface feet per minute in small hole grinding is generally enough reason for manufacturers to consider the use of high-frequency equipment. But when this demand is coupled with requirements of speed, economy and efficiency, most people naturally are turning to Heald for the answer.

New Heald Hi-Frequency Red Head Wheelheads are designed to operate at speeds well in excess of the normal belt driven type giving you the extra surface feet per minute required.

Heald Hi-Frequency Red Heads permit extremely high speed and virtually vibrationless operation, thereby effectively increasing the precision characteristics of the finished product.

The application of Heald Hi-Frequency equipment is not confined to the grinding of very small holes alone. Some manufacturers have found the use of Hi-Frequency heads to be extremely satisfactory for larger size work. But large or small, the application of high-frequency equipment is a specialized proposition. Why not let your nearest Heald representative discuss your particular high speed, high accuracy grinding requirements with you?

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

THE HEALD MACHINE COMPANY
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American Machinist

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Chips and QUIPS

Our Cover . . . A shot's eye view of shot-peening makes our unusual cover picture. The piece is an aluminum crankcase section for a Pratt & Whitney aircraft engine. Thousands of steel shot are hurled against the metal by air blast from the hose. Each shot is a tiny hammer which peens the surface to compress and strengthen it, thus preventing formation of hairline surface cracks which might develop into part failures. Work is done in a special cabinet, the operator having his arms encased in rubber gloves with sleeves and his eyes protected by safety glass plate and special goggles.

Safety . . . October is annually considered as "safety month". To recognize that fact, we offer you herewith a concise Special Report describing "How to Operate a Safety Program." Associate Editor Andy Ashburn has visited half a dozen companies known to have top-flight programs in operation, gotten data on others and general suggestions from the National Safety Council, distills it for you here into the essence of practicality. One of the best things about plant safety is that it pays its way.

For Tool Men . . . J. R. Paquin comes up again in this issue, to discuss the design of progressive dies in a series that has enjoyed great popularity . . . Also, H. P. Bailey concludes his 10 article suggestions on portable tools . . . Jig milling at Towmotor has saved 40% of the time and cut tooling costs; we've a compact description of how it's done . . . Then there are some Shop Shots from Sangamo Electric and two pages on how to machine racks and pinions.

Spinning . . . Metal spinning is still largely a secret process, and the old timers who are specialists in it guard their secrets well. Descriptions of the process are usually general in content and include no data that the reader can use. In this issue, however, we include a real "scoop"—a set of tables based on the long-time experience of a well-known company in the field. They permit costing on spinning.

Smoking . . . A.M. Elliott has written many discussions of Round Table subjects, now is trying his hand at something broader. His first formal article is in this issue—dealing with the smoking problem. He's done some personal and some mail research, summarizes it here to give suggestions on a familiar personnel problem.

Jet Turbines . . . We've been hard after releasable information on producing jet turbine parts for some time now, and have managed to uncover several really basic articles. In this issue is another discussing the problem of inspecting blades, and prepared by two engineers at the NACA Cleveland Laboratory (see biog. note on this page). It is a problem, not yet solved on a high-production basis, for precision and quantity here conflict as usual.

Research Savings . . . Dr. Max Kronenberg, formerly with Cincinnati Milling Machine and now a consultant, has drawn upon his experience to suggest a practical way in which mathematics may be used to cut the cost of machining studies. It involves projection of key studies to fill intermediate areas . . . Also on research we have a paper by Nikola Trbjovich on elliptic involutes that will interest all gear men in particular.

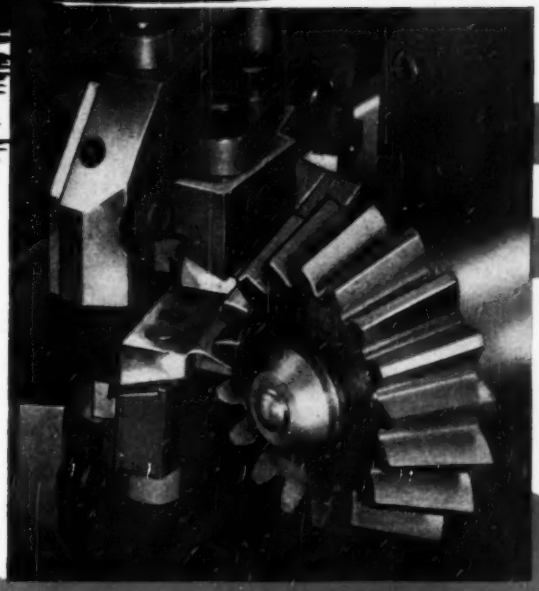
Coming . . . *A.M.* for Oct. 6 will feature our Cost Cutting Clinic, a major Special Report offering a series of check lists for analyzing production costs. It's based on extensive research, both in *A.M.* and among manufacturers; will give you suggestions as saving dollars becomes more important. The issue will also include several articles and all the usual departments, so it's a bonus number to start the Fall off with a bang. In addition, it will include an advance picture of what's new at the Metal Show in Cleveland, Oct. 17-21.

BLADE MEASURERS—Dan White, (right) Chief, Fabrication Div., and Henry Meltzer, toolmaker, Cleveland Laboratory, National Advisory Committee for Aeronautics, have collaborated in describing a master measuring system for checking jet engine blades in this issue. Here they are pictured as they discuss problems in measuring a blade with an exceptionally long and awkward base which is completely instrumented. A major problem is the fact that the instrumentation (the wires sticking out of the blade end) must remain in place. At lower left is the microscope set up for measuring a more conventional blade. This unit can measure curved surfaces within plus or minus 0.0003-in.

COMPLETELY UNIVERSAL...

for

ROUGHING *and* FINISHING



The No. 14 Straight Bevel Generator employs the generating method in which the tooth profile shape is produced by rolling the tooth between the two reciprocating tools.

The Gleason No. 14 Straight Bevel Generator produces Coniflex gears in the intermediate sizes. These straight bevel gears are both roughed and finished on this machine. Many outstanding features of this machine contribute to its versatility, such as:

1. The ability to cut Coniflex gears (i.e., straight bevels with localized tooth bearing).
2. Faster cutting times made possible through greater machine rigidity.
3. Ease of operation—sliding base movement and clamping of work are hydraulically operated. All controls are centralized within easy reach of the operator.

Gleason No. 14 Straight-Bevel Generator

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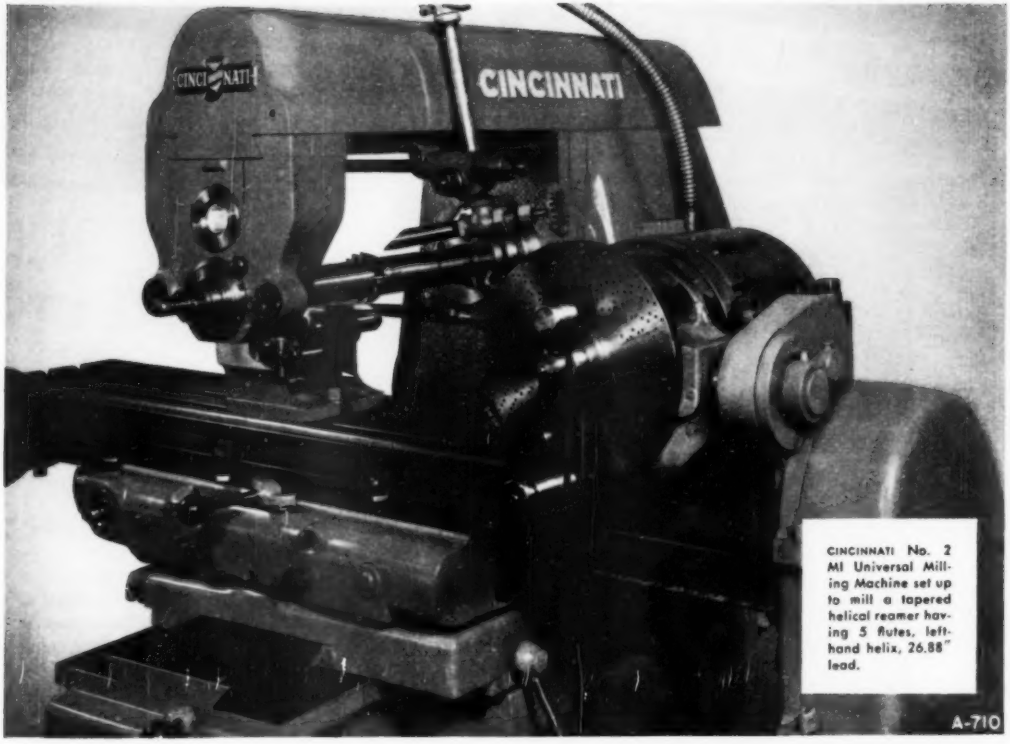
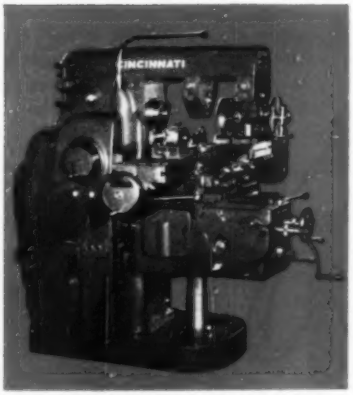
Builders of Bevel Gear Machinery for Over Eighty Years



CINCINNATI No. 2 MI Universal Milling Machine set up to mill a tapered helical reamer having 5 flutes, left-hand helix, 26.88" lead.

A-710

They Take Over a Wide Variety of Toolroom Milling



CINCINNATI No. 2 MI Universal Milling Machine. Send for catalog M-1662. It contains complete data covering No. 2 MI plain, universal and vertical milling machines, and No. 2 ML plain and universal machines.

Almost any job is liable to pop up for a toolroom miller . . an accurate spline shaft job, milling gear teeth, graduating a dial, milling the flutes in taper reamers, milling the angles on planer tools. All these jobs and many more, can be assigned to CINCINNATI No. 2 MI Milling Machines.

They have a spindle speed range of 25 to 1500 rpm, covering the requirements for cutters ranging from face mills to small boring tools. Feeds range from ¼" to 30" per minute. To facilitate the selection of the correct elements for efficient metal cutting, feeds and speeds are changed with single crank type controls. The Cincinnati Dividing Head supplied with universal millers has the desirable combination of rugged construction and the highest order of accuracy. Additional information may be obtained by writing for literature.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

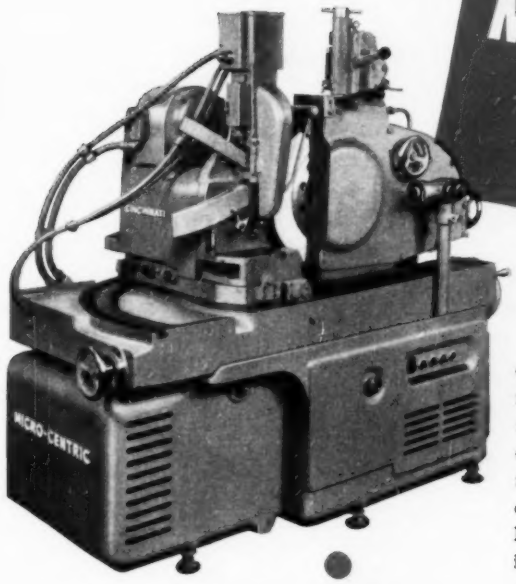
MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

CENTER TYPE GRINDING

CENTERLESS GRINDING

NOW!

MICRO-CENTRIC GRINDING



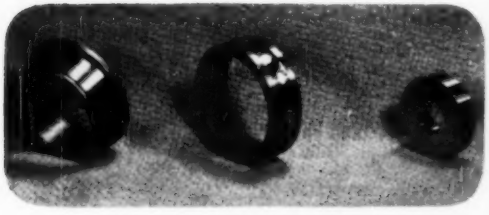
CINCINNATI FILMATIC No. 1 Micro-Centric Grinding Machine with automatic loading fixture. Manual or automatic loading fixture optional. Complete details in catalog G-573.

FILMATIC

CINCINNATI FILMATIC Micro-Centric grinding is a new, low cost method of obtaining exceptionally close three-way accuracy: 1) sizing, 2) roundness, and 3) squareness with one end of the part. It is made possible by a new method of work rotation and support, incorporated in CINCINNATI FILMATIC Micro-Centric Grinding Machines. Without working from centers, true roundness is generated within .000025", and squareness with one end within .000025".

These machines are suitable for grinding short work, such as bearing races and other parts like those shown in the illustration. Two sizes are available: No. 1, capacity ¾" to 3½" diameter; No. 2, capacity 2" to 8" diameter.

Investigate Micro-Centric's low cost method of producing closer accuracy than hitherto obtainable on a production basis. Complete information is yours for the asking.



Typical Micro-Centric ground parts. Accuracies of roundness and squareness with one end within .000025" can readily be obtained.

CINCINNATI

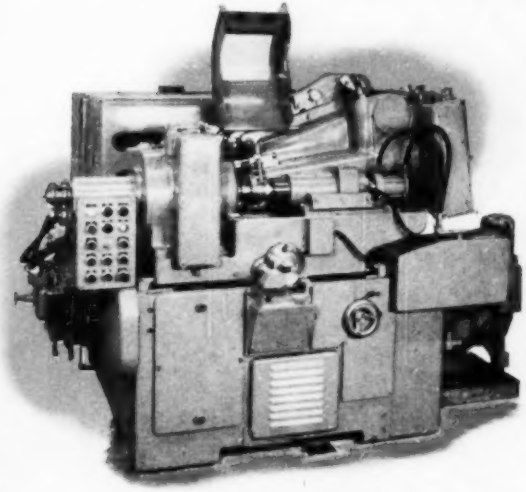
CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

And
Gear
by

now comes Finishing — a New FELLOWS Process...



New Fellows No.12 Gear Finisher for external spur and helical gears up to 12½ inches pitch diameter.

1 **Gear shaving by a new principle employing a free-cutting tool that avoids burnishing**

2 **Cutters sharpened in your own plant by a simple face grinding operation**

3 **Both sides of teeth finished in one cutter traverse... Fast action, full-automatic cycling**

4 **Stock removal possibilities much greater than ever before**

Write or telephone the nearest Fellows office for machine data, production time estimates, etc.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department, 78 River Street, Springfield, Vermont, U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

The Van Norman No. 38 Miller gives you many cost-cutting advantages not found in any other miller of this type. The heavy, rugged column and sturdy ram are constructed to take all types of cuts including carbide milling. The massive cutterhead has a 10 HP motor driving the spindle, providing a 100% increase in power. Cutterhead speeds have been increased to 2000 RPM for high speed work.

It will pay you to investigate the advantages of this New No. 38. Check its features against other millers and you'll find it gives you greater opportunities to cut costs and increase production. Write for information.

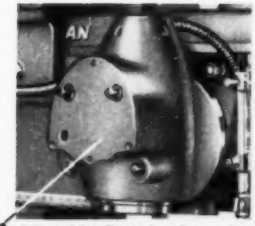
Production Work Hours . . .

VAN NORMAN

No. 38

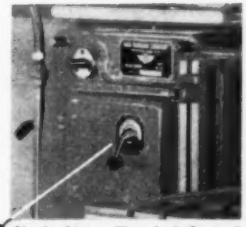
RAM TYPE MILLING MACHINE

A Heavy-Duty Miller that provides many cost-cutting advantages

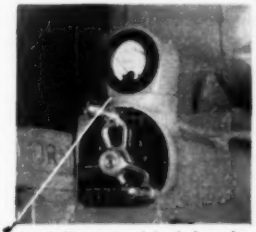


Adjustable Cutterhead permits horizontal, angular and vertical milling on *one* machine. Graduated in degrees for easy positioning.

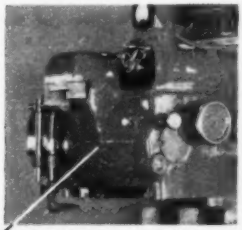
Front and Rear Controls of all power feeds can be operated from either position. Manual controls are also at front and rear.



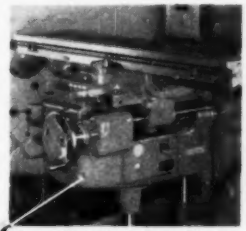
Single Lever Electrical Control controls spindle, feed, and coolant. The same lever reverses spindle direction.



Load Meter is right before the operator's eyes . . . gives visual indication of the "percent of load" that the machine is being operated under.



Massive Ram is heavier and stronger than on other machines. It is reinforced throughout for ruggedness and long life.

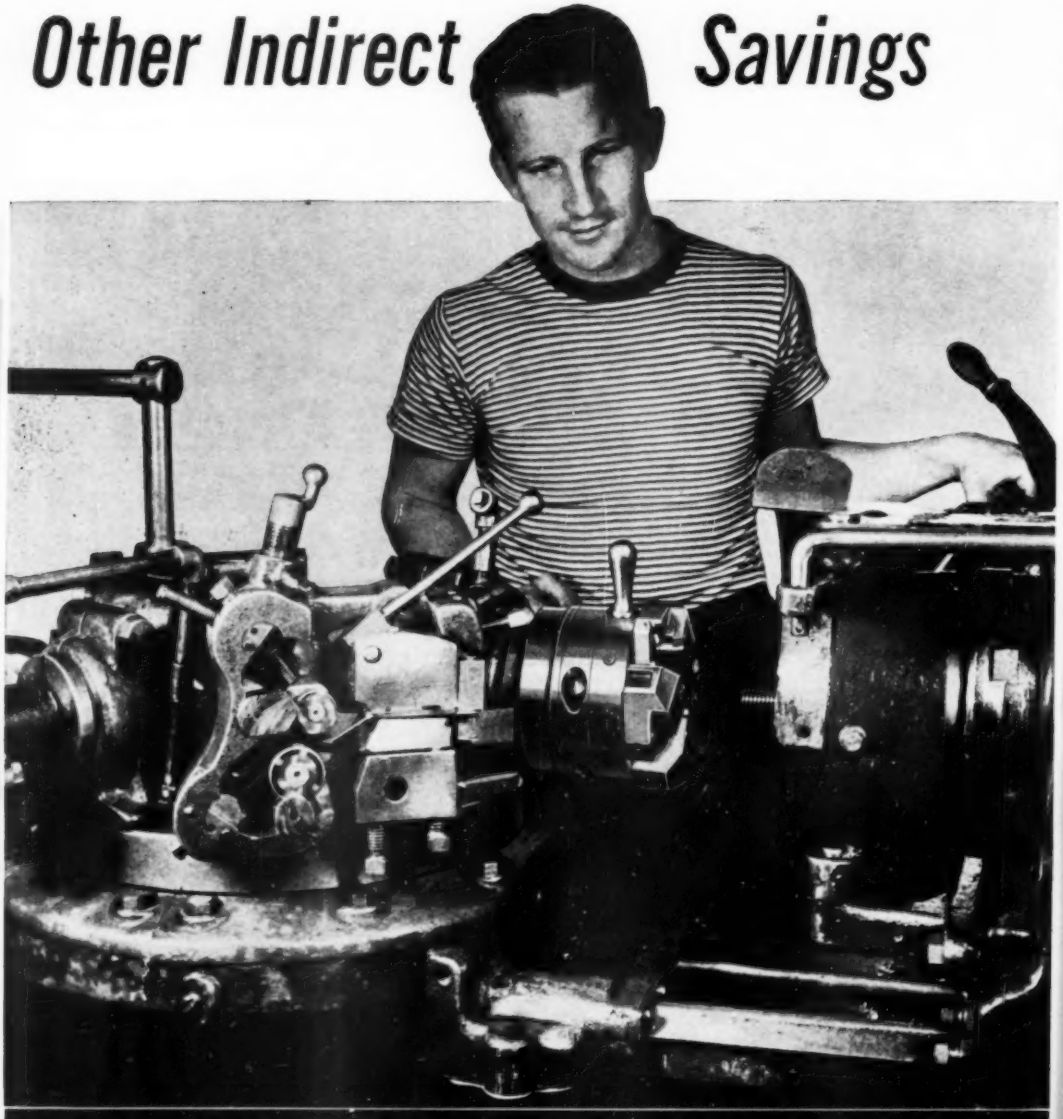


Heavy-Duty Knee Assembly, including table and saddle, is designed as an integral unit to provide maximum rigidity and accuracy.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

NOW . . . . . 36 PIECES

Other Indirect Savings



WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

THREADED INSTEAD OF 1

in Tool Cost and Tool Inventory

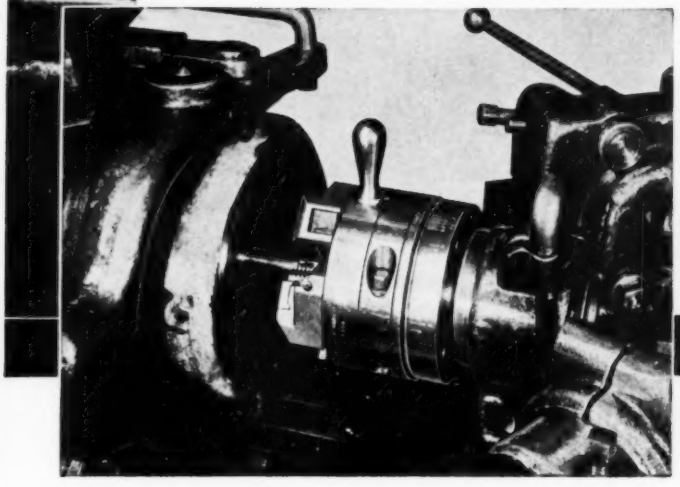
This manufacturer had cut threads on adjusting screws in the past by making several passes with a single point tool. Actual chasing time on the .623 in. diameter 8 pitch thread 1 3/8 in. long was 4.86 minutes.

LANDMATIC Die Heads were installed to perform these operations. Immediate savings were realized when actual threading time was cut to 8 seconds.

LANDMATIC Die Heads are well-suited to cutting these modified square threads. Rigid construction holds the chasers firmly—line contact with the work reduces friction and cutting strains—thus making it possible to produce the thread in a single pass.

Other savings accrued from LANDMATIC Heads. Interchangeable chasers can be re-ground singly, and for over 80% of their length. A single chaser can be replaced in the set. Chasers will maintain a more consistent thread form than a single point tool.

For more information about these cost-cutting tools, write for Bulletins F-80 and F-90.



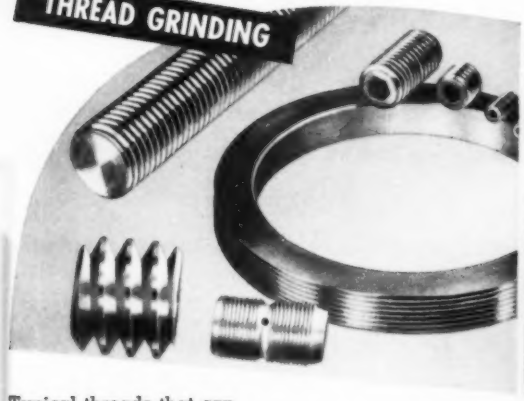
LANDIS Machine COMPANY
WAYNESBORO, PENNA.

GENERATING EQUIPMENT

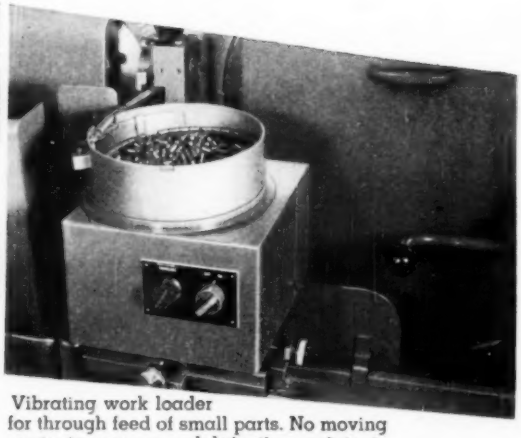
GRINDING IDEAS with versatile

production increased up to 400%
accurate thread form
bright finish

THREAD GRINDING

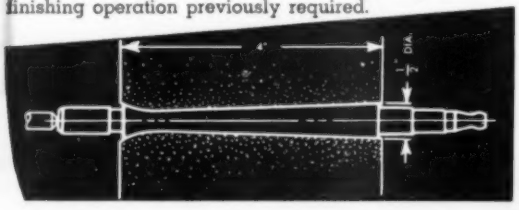


Typical threads that can be ground on hardened or unhardened stock by through feed on a single pass to as close as class III fit. Also suitable for parts made of powdered metal, hard rubber, plastics, aluminum, brass from solid stock or tubing.



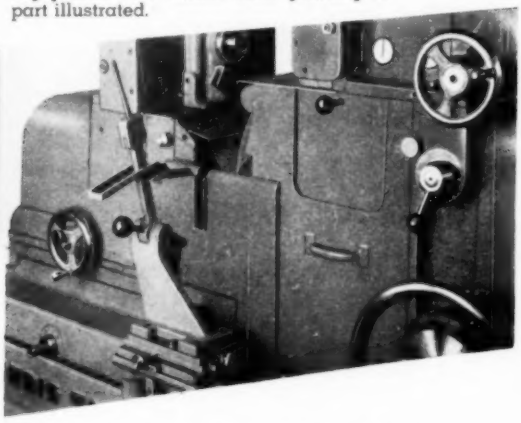
Vibrating work loader for through feed of small parts. No moving parts to wear, no lubrication points to attend.

Grinding wheel may be crush formed or diamond dressed to shape. Regulating wheel diamond dressed to desired form. Production 250 per hour, 0.020" stock removal. Fine finish permits chrome plating without finishing operation previously required.



INFEED FORM GRINDING

Simple hand operated work loader in loading position for infeed form grinding of part illustrated.



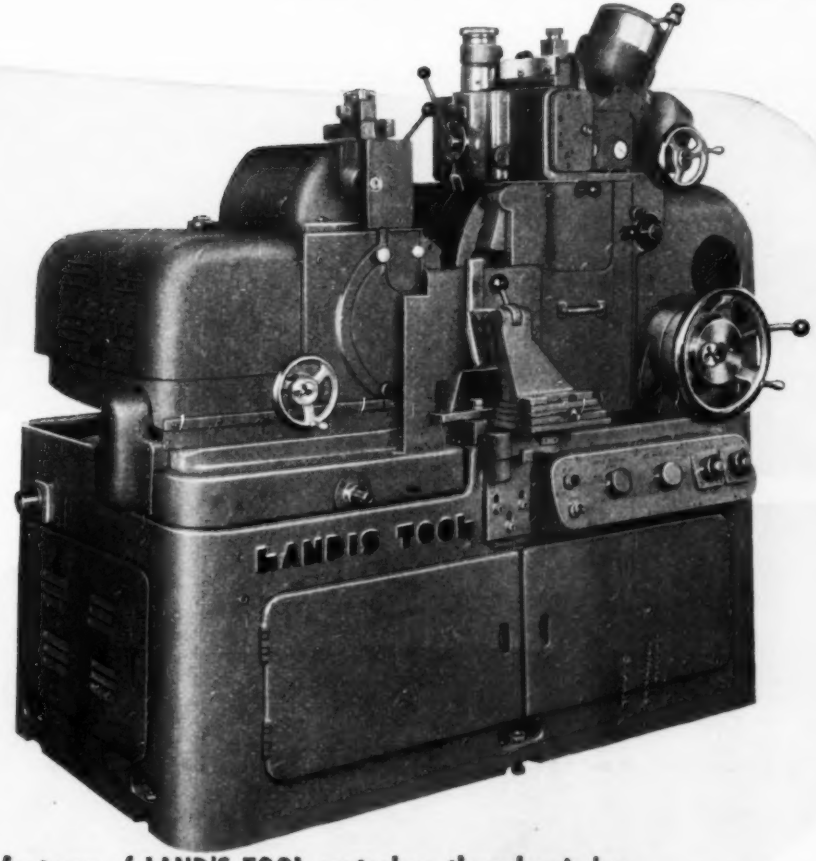
production doubled
finishing operation eliminated

If you have a precision grinding problem, production estimates and tooling suggestions will be made on the basis of your blueprints.

LANDIS TOOL COMPANY WAYNESBORO, PENNA.

LANDIS TOOL Centerless Thread Grinder

Centerless thread grinding pioneered by LANDIS TOOL. These grinders backed by more than 50 years of experience in manufacturing precision grinding machines.



features of LANDIS TOOL centerless thread grinder

Microsphere bearings—both wheel spindles
Work rest solidly mounted on bed
Simple variable speed control
for regulating wheel

For details request Bulletin CTG47

LANDIS TOOL
Precision Grinders

These new folders are available upon request

STE

WHERE MOLDS ASSURE WHEELS

STERLING'S PRODUCT DEVELOPMENT TECHNIQUE

Regardless of demand, Sterling's stock of molds is sufficient to make available all necessary types for quick production of the "Wheels of Industry" you need. Each mold is an advance visualization of the many manufacturing details necessary to produce each abrasive item . . . a positive assurance of superior quality in your "Wheels of Industry".

"THE WHEELS OF INDUSTRY"
STERLING
GRINDING WHEELS

RLING

MADE TO PRECISE DIMENSIONS OF UNALTERABLE ACCURACY

Molds of special, heat treated steel, created and manufactured under the exacting conditions of Sterling's New Research and Development Program, assure grinding wheels of precise accuracy. Each wheel, segment or abrasive shape imposes forming problems which Sterling technicians solve. Sterling's mold department has sufficient numbers of each type to assure quick production of the "Wheels of Industry."

The exacting requirements under which Sterling Grinding Wheels are produced, the application of new techniques and creative skills—all are ample assurance that the abrasive tools you need can be quickly furnished to the degree of perfection necessary for the solution of your grinding problems.

Fortified by the decades of experience represented by a competent staff of engineers and laboratory technicians, Sterling's New Research and Development Program has much to offer industrial executives seeking the better-than-ordinary grinding wheel. A study of your particular needs can be made at no obligation.

STERLING RESEARCH AND DEVELOPMENT IN ACTION

FIRST STEP - Phoning your nearby Sterling distributor is a good way to solve any grinding problem that may suddenly arise.

SECOND STEP - Your distributor's representative, in company with a Sterling engineer, will quickly call and consult with your operator.

THIRD STEP - Back in the Sterling laboratory, the technical details of your grinding job are studied and a remedy found in a wheel of special specification.

FOURTH STEP - The advantages of working closely with your Sterling distributor and engineer are apparent in the quicker service and better grinding obtained.

THE STERLING GRINDING WHEEL DIVISION

of

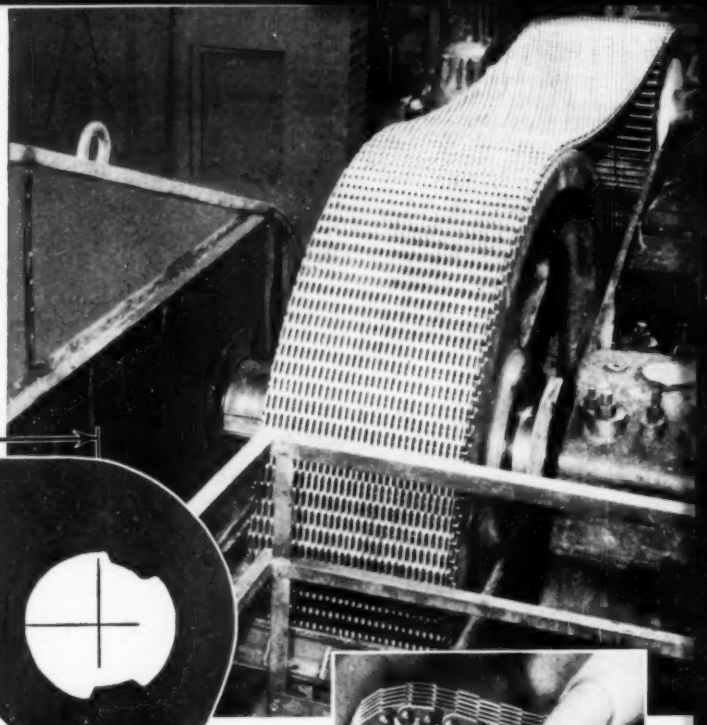
THE CLEVELAND QUARRIES CO.

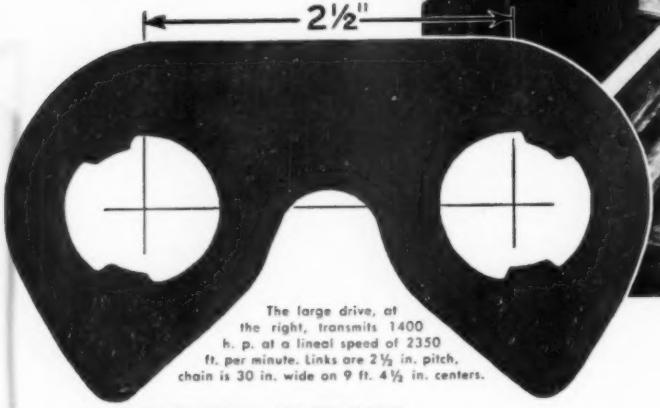
TIFFIN, OHIO

Since 1885, Manufacturers of "The Wheels of Industry"

Branches: Boston, Chicago, Cleveland, Detroit, Los Angeles, Philadelphia, New York. Distributors In All Cities.

Remember These OUTSTANDING ADVANTAGES





The large drive, at the right, transmits 1400 h. p. at a lineal speed of 2350 ft. per minute. Links are 2½ in. pitch, chain is 30 in. wide on 9 ft. 4½ in. centers.

of LINK-BELT *Silverstreak* SILENT CHAIN DRIVES

Full production at rated capacity results from eliminating slip in power transmission. With Link-Belt Silverstreak silent chain drives, slip is impossible. Every revolution of the motor is transmitted to the driven machine. Losses due to slippage are eliminated and output is increased. Yet Link-Belt Silverstreak silent chain possesses sufficient flexibility to absorb shock. Even on short centers, it runs slack which minimizes friction and wear. Moisture, temperature, age or periods of idleness have no effect on these all-steel precision-built drives. For utmost efficiency and economy, choose Link-Belt Silverstreak silent chain drives.

LINK-BELT COMPANY

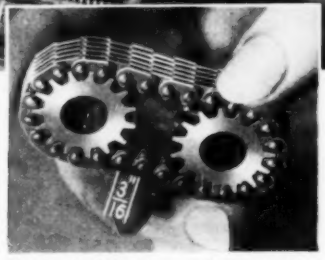
Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Houston 3, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities.

11.3514

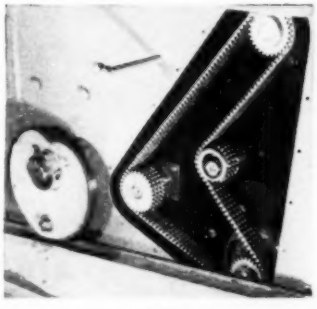
LINK-BELT

Power Transmission Machinery

"THE COMPLETE LINE"



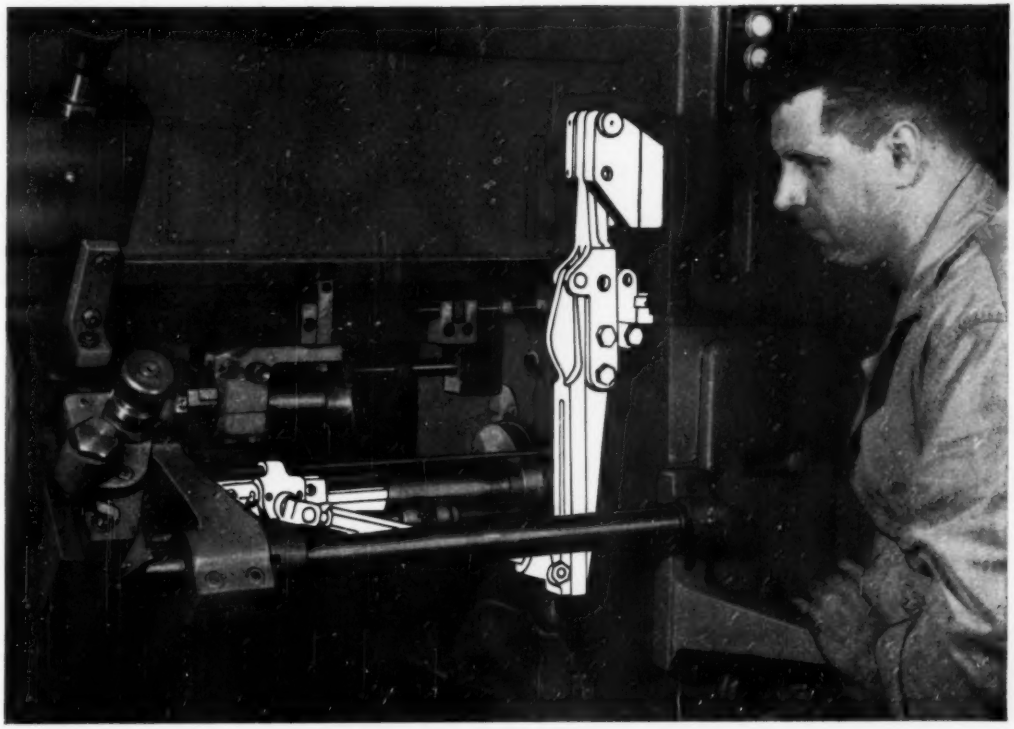
Smallest Link-Belt Silverstreak silent chain is ⅜ inch pitch. It has been developed for positive, flexible, quiet, high-speed power transmission at fractional h.p.



Duplex type can be flexed to run on either side for reverse rotation of any shaft.

• • •

Link-Belt Industrial Standard Silent chain drives, chain and sprockets, ½ to 50 h.p. are available from stock at Link-Belt Distributors or Factory Branch Stores in all principal cities. Easy selection tables given in Book 2125-A. Ask for your copy today.



AN "Extra Position" FOR LOW-COST PRODUCTION

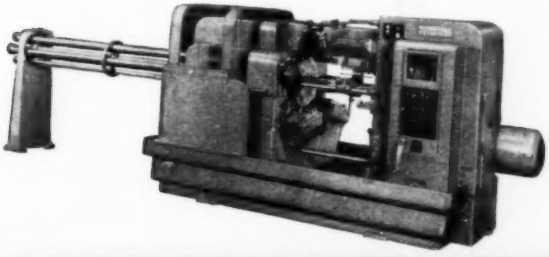
At the Cut-off Position on a Warner & Swasey Automatic
You Can Also Drill, Ream, Face, C'bore, Tap or Thread

When we ask users of Warner & Swasey Multiple Spindle Automatics what they find pays off most they invariably mention, first, "unusually fast setup" —then, the "extra position".

On their Warner & Swasey they have found they can use the fifth position reaming attachment for many operations, prior to cut-off and bar feed.

It gives them an extra position that enables more operations to be completed in the same cycle time.

Find out how you can reduce costs, boost your man-hour output, make a greater return on your investment in a machine tool. Call your nearest Warner & Swasey Field Representative or write . . .



It's simpler to set up a Warner & Swasey CAMLESS Automatic!

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

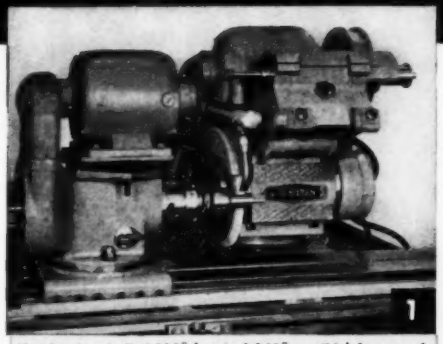
Here's Why the new

NORTON 10" x 20" UNIVERSAL GRINDER

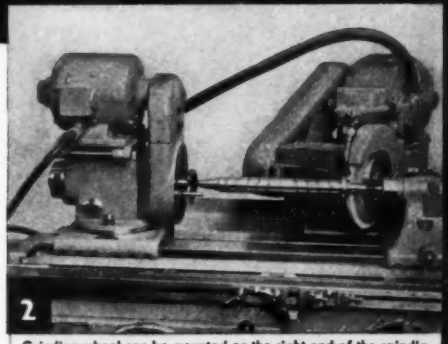
NORTON GRINDERS *and Lappers*

Abrasives · Grinding Wheels · Grinding and Lapping Machines · Refractories · Porous Mediums · Non-slip Floors · Norbide Products · Labeling Machines

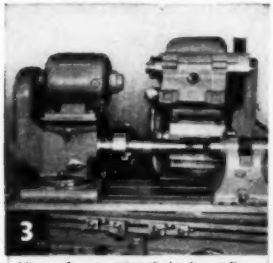
is a Handy, *Flexible* Machine *for the* TOOL ROOM *and* PRODUCTION WORK



Headstock swivelled 180° (total of 360° possible) for use of conventional or speed chucks. Note center and driver at other end for center type operations.



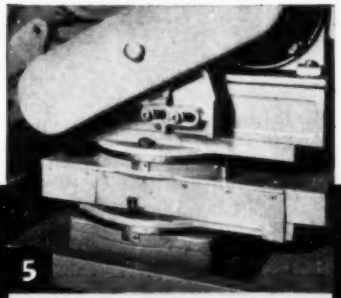
Grinding wheel can be mounted on the right end of the spindle whenever the nature of the job makes this either desirable or necessary. See other views for normal mounting.



View of conventional chuck application to standard cam lock nose on Headstock of Norton 10 x 20" Universal. Note how Internal Grinding Attachment locks in "Up" position.

1. **FLEXIBLE Double-end Headstock**
2. **FLEXIBLE Double-end Wheel Mount**
3. **FLEXIBLE Set-ups for Cylindrical Grinding**
4. **HANDY Internal Grinding Attachment hinged to front of Wheel Slide**
5. **FLEXIBLE Compound Swivel Wheel Slide**
6. **HANDY closely grouped controls**

Internal grinding with Norton 10 x 20" Universal. Note compact sturdiness of hinged type Internal Grinding Attachment which is quickly brought down into grinding position.



Wheel feeding possible at any desired angle regardless of wheel spindle angular position, through Compound Swivel Wheel Slide arrangement.

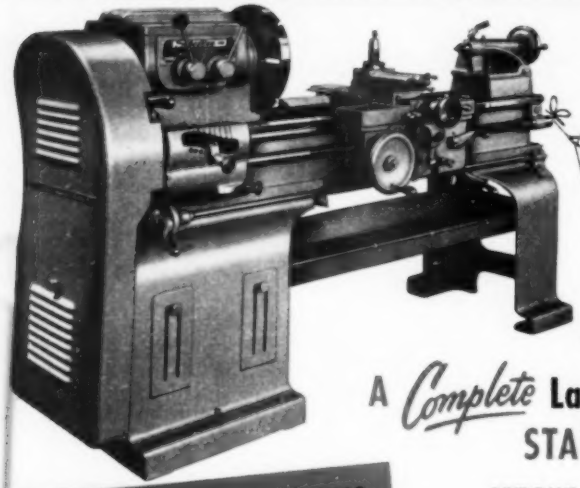
This NEW, flexible NORTON Universal will bring economy to your jobs that require a multipurpose machine of this capacity. It is precise and dependable. Work speed changes from 50 to 500 r.p.m. by fingertip electronic control. Outstanding ease in handling makes it a "must" in tool room equipment programs.

Close grouping fingertip positioning of operating controls makes operation fast and effortless.

NORTON COMPANY, WORCESTER 6, MASS. · New York · Chicago · Detroit · Cleveland · Hartford · Distributors in All Principal Cities

Sebastian 16" x 6' LATHE

8-SPEED GEARED HEAD



$1995

PLUS FREIGHT

"Best Buy" in the Medium-Price Field!

A *Complete* Lathe, including the Following STANDARD EQUIPMENT:

DRIP PANS • THREADING DEPTH STOP • TOOL POST
CENTERS • LEVELING SCREWS & PLATES • FACE PLATE
MOTOR & WIRING • REVERSING SWITCH • SPINDLE SLEEVE
DOG PLATE • WRENCHES • CABINET LEG

PRINCIPAL SPECIFICATIONS

Swing over bed	16¼"
Width of bed	11⅛"
Length of carriage	22⅛"
Speed range, std. r.p.m.	20 to 487
Speed range, high r.p.m.	30 to 741
Number of thread and feed changes	57
Feed range	.002" — .259"
Thread range per inch	3 to 384
Horsepower of motor	2
Weight, crated	2525 lbs.

Send For These FREE CATALOGS!

Illustrated Sebastian Catalogs S-1 (Standard Lathes) and S-101 (Special Lathes—Gap, Clutch & Brake, etc.), give complete description and detailed specifications. See for yourself why the modern Sebastian is today's outstanding value!

At the price featured above, this sturdy "King-made" 16" x 6' Sebastian Lathe is by all odds the best investment in the medium-price lathe field today.

Here's simple design, husky construction, sound engineering, a host of special features, in a general purpose Lathe with unusual ease of operation and low, LOW maintenance cost!

The Sebastian's many outstanding features include a powerful 8-speed geared head—Timken Bearings on all headstock shafts—reverse in apron for feeds—control handle on apron for longitudinal friction feed—accuracy .0005" at every point of alignment.

Sebastian general purpose Lathes are available in 12" and 20" swing, as well as the 16" shown here—also Gap, Clutch and Brake, and other special types.

Before deciding on any lathe, it will pay you to make a point-by-point and dollar-for-dollar comparison of the Sebastian Lathe with others in the medium-price field. A thorough investigation will convince you that the modern Sebastian is *your* "best buy"!

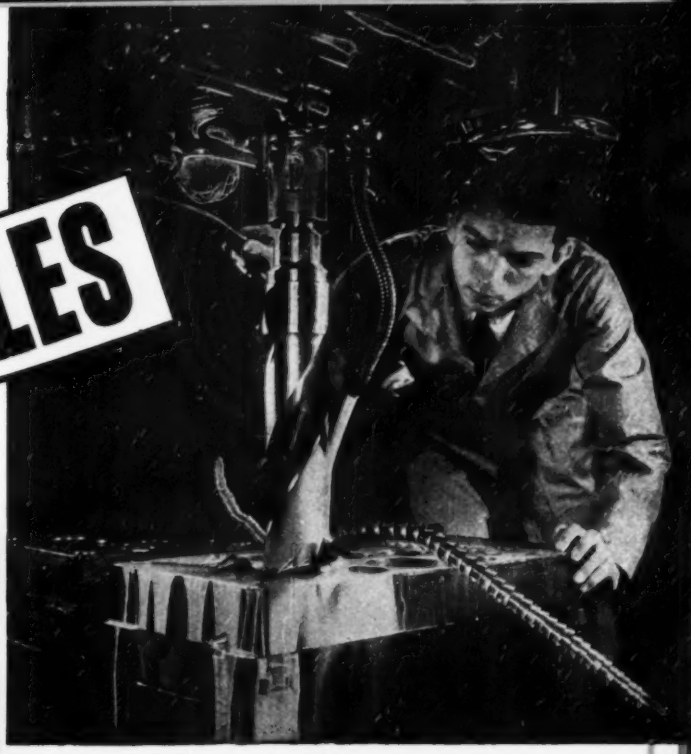
American Steel Foundries

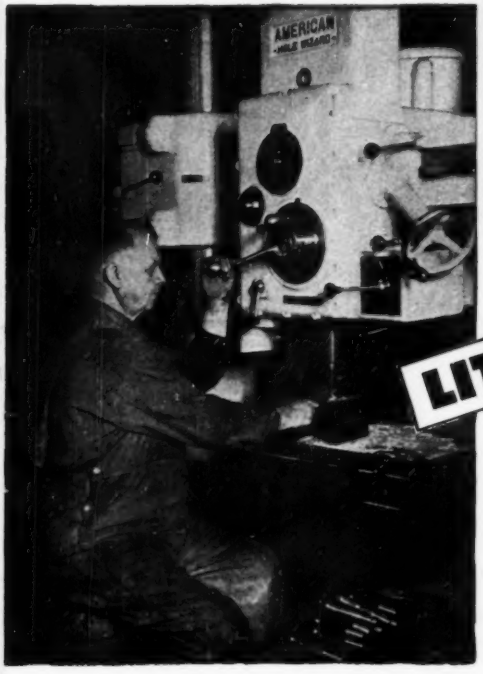
KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

BIG HOLES





LITTLE HOLES

It makes no difference — there's an "AMERICAN" for every job.

"AMERICAN" Hole Wizard Radials are meeting the challenge of intensive production without a whimper. Day in and day out in the production shops throughout the country they are drilling, boring and tapping at top speed and at the same time maintaining amazing standards of accuracy.

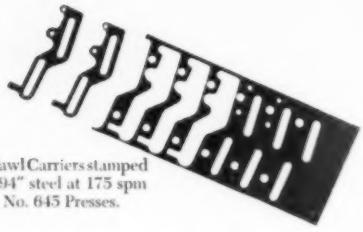
Manufacturing shops that have established enviable records for low cost production are using "AMERICAN" Radials.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

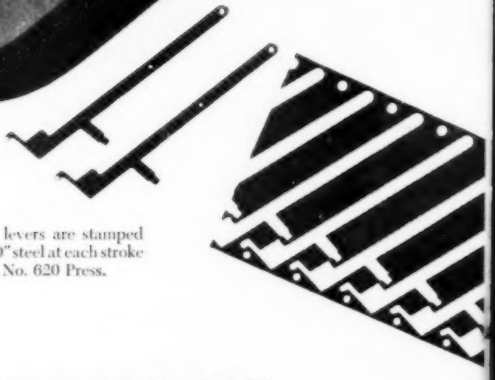
Lathes and Radial Drills

How IBM clicks off short-run stampings on BLISS Automatics



Index Pawl Carriers stamped from .094" steel at 175 spm in Bliss No. 645 Presses.

IBM Electric Typewriters and precision electric punched card accounting machines contain over 1500 different parts produced on Bliss High-Production Presses.



Two key levers are stamped out of .040" steel at each stroke of a Bliss No. 620 Press.

BLISS BUILDS MORE TYPES AND SIZES OF PRESSES THAN ANY OTHER COMPANY IN THE WORLD

Quick die changeover speeds output of 1500 different parts...production increased 25-30%

Die changeover is really simple on Bliss High-Production Presses—takes less than 20 minutes per set-up at International Business Machine's Poughkeepsie, N. Y., plant. From there on it's clock-work. IBM attributes stamping production increases of 25-30% to this factor and to the reduced handling of automatic operation as compared to previous results with open back inclinable presses.

Turning out short production runs of over 1500 different parts during each quarterly manufacturing schedule is the job of five Bliss No. 620 and No. 645 High-Production Presses. Low-tolerance part runs for accounting machines may be as little as 3,000 per set-up.

Die Life Doubled...Die life has *doubled* for IBM since Bliss High-Production Presses were installed at war's end. With one 4-stage progressive die they've already stamped out between 3 and 5 million typewriter tab keys from .048" steel to tolerances of .001" or less in every dimension, without appreciable wear on the die. The most IBM had hoped for was 2 million parts, but the tab die is still going strong. Because of their short runs, most other dies haven't approached that figure yet.

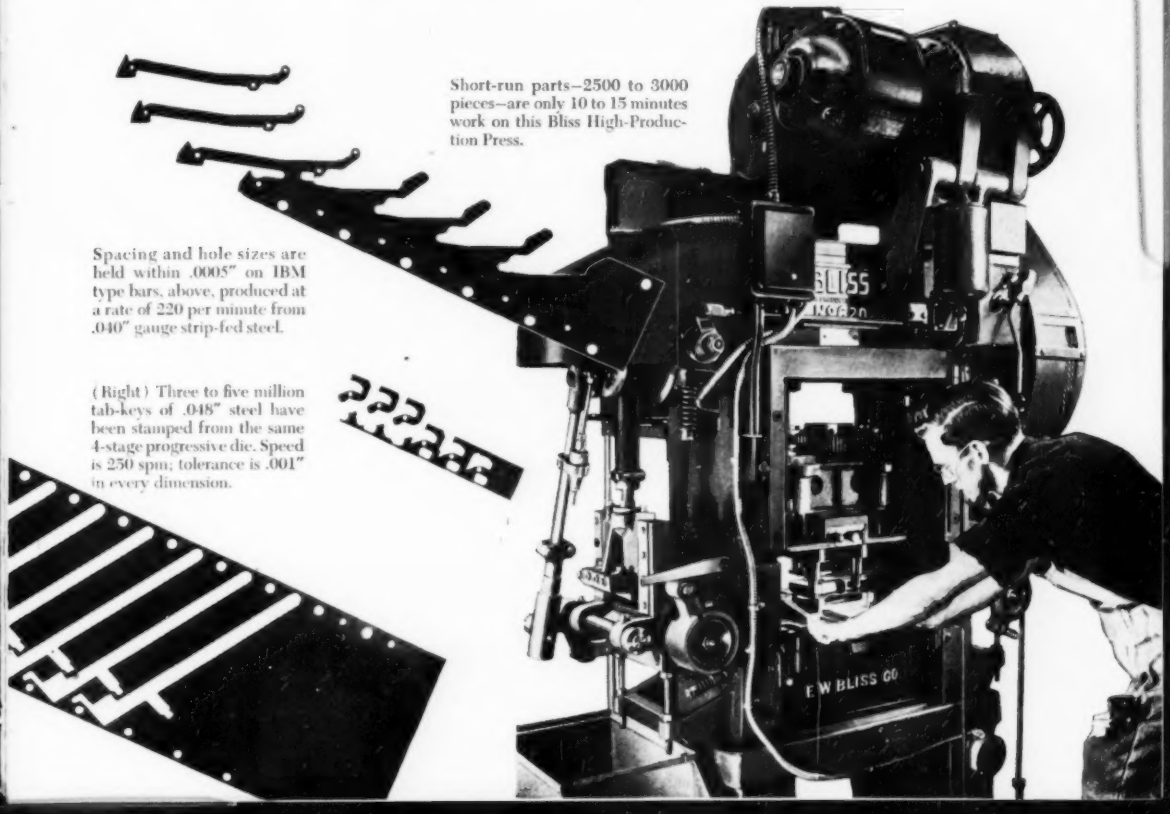
Hold Feeds to .003"...With Bliss Automatics IBM is also able to hold feeds to .003" allowing the die-maker in his design to reduce material scrap.

For long or short runs, from coiled or strip-fed stock, Bliss High-Production Presses can spell economy and efficiency for you, too. You'll get dependable (IBM hasn't required outside service in four years), easy-to-operate equipment that makes possible maximum output for both man and machine. Automatic feeds, indexing and ejecting features are available as required. Our catalog 27-B gives full details. We'll gladly send it to you.

E. W. BLISS COMPANY, TOLEDO 7, OHIO

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

WORKS AT: Toledo, Salem, Ohio; Hastings, Mich.; Derby, England; St. Ouen sur Seine, France • SALES OFFICES AT: Detroit, Mich.; New York, Rochester, N. Y.; Cleveland, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.



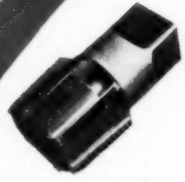
Short-run parts—2500 to 3000 pieces—are only 10 to 15 minutes work on this Bliss High-Production Press.

Spacing and hole sizes are held within .0005" on IBM type bars, above, produced at a rate of 220 per minute from .040" gauge strip-fed steel.

(Right) Three to five million tab-keys of .048" steel have been stamped from the same 4-stage progressive die. Speed is 250 spm; tolerance is .001" in every dimension.

THERE'S NO BETTER
INVESTMENT THAN THE
"Right Tools for the Job"★

Pratt & Whitney Cutting



It pays to acquire this convenient habit: order the cutting tools you need . . . taps . . . dies . . . drills . . . reamers . . . cutters . . . punches . . . counterbores or cutting-off tools . . . thread rolling dies . . . miscellaneous tools . . . from your nearest P&W Office. The accuracy of these tools may be taken for granted because they bear the P&W stamp. In addition you are assured the lasting performance that comes from expert design, precision metallurgical control and skilled craftsmanship.

★ The Right Tools
IMMEDIATELY
AVAILABLE TO YOU
FROM NEARBY STOCK

Want a complete listing of all P&W cutting tools? The 444 page Small Tools Catalog contains full information — ask us to send a copy, there's no obligation.

Pratt & Whitney
Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

PRECISION

Tools

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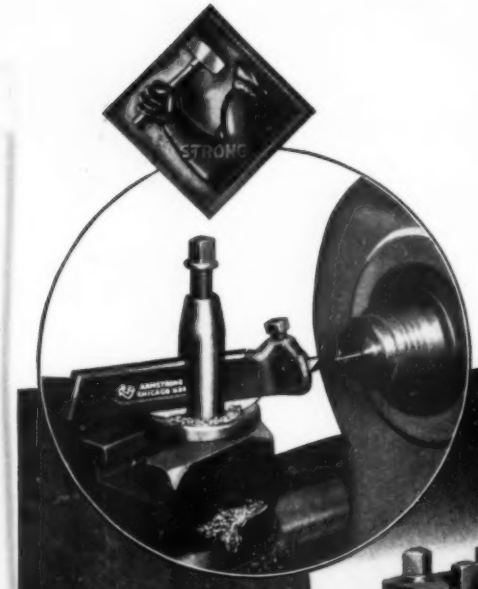
Office only at Comer Bldg., Birmingham

Pictured on these pages are random selections of the P&W line of fine Cutting Tools, which includes all types, styles and standard sizes of Taps — Dies — Screw Plates — Cutters — Reamers — Punches — Drills — Threading Tools — Carbide Tipped Tools. Also Special Tools, designed for your needs by experienced engineers and made by skilled craftsmen.

CUTTING TOOLS

ARMSTRONG

TOOL HOLDERS... for every operation!



There are ARMSTRONG Tool Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED, ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

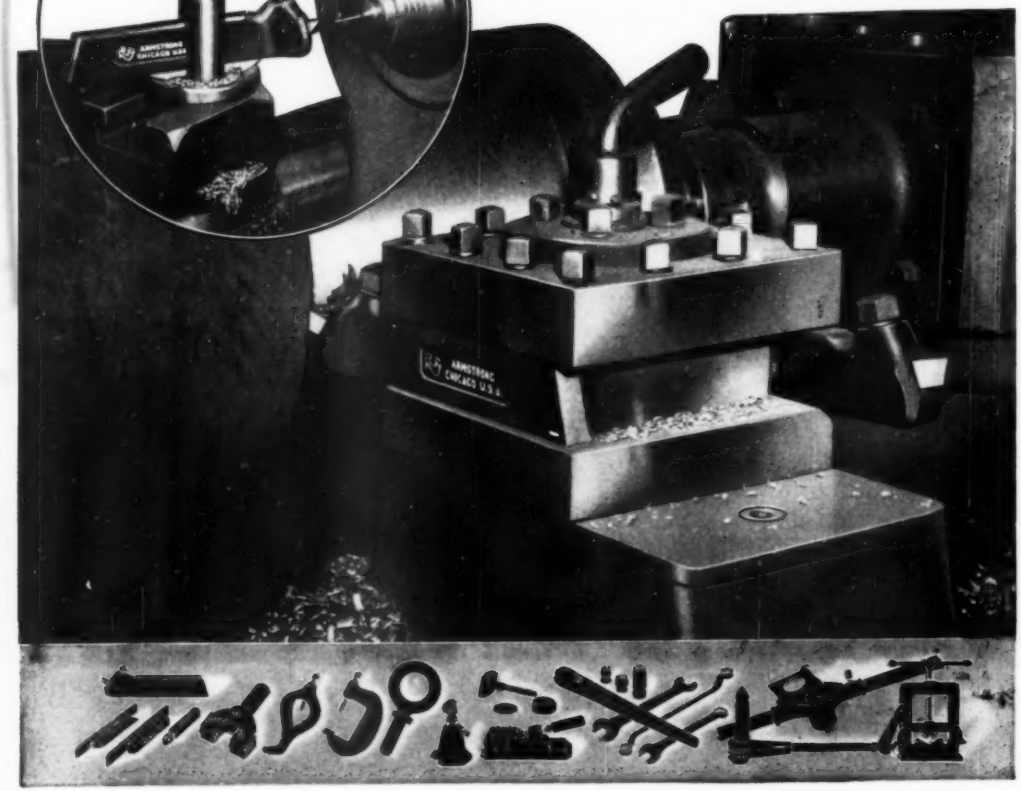
These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per pieces.

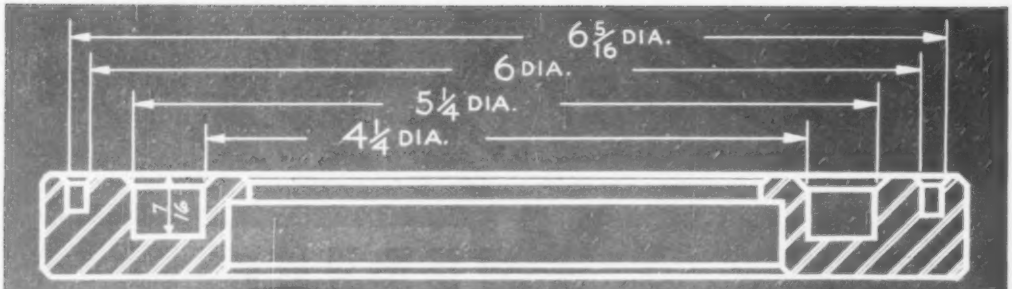
Write for Our New S-48 Catalog.

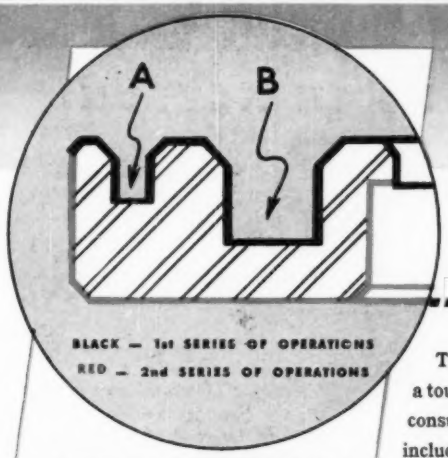
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. Armstrong Ave. Chicago 30, Ill.







TO MAKE IT PAY ..CONSULT P&J

POTTER & JOHNSTON TOOLING SOLVED THIS "TOUGH ONE"

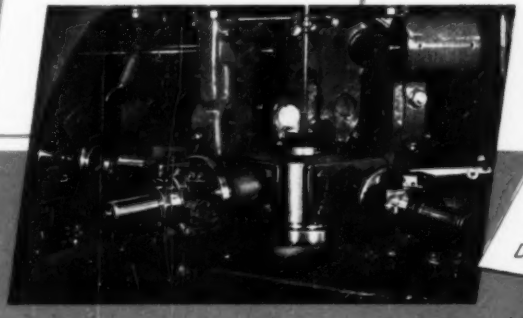
The close-up drawing clearly shows the amount of machining on this forged steel ring — 21 different operations. "A" refers to the trepanning cut from the 6 5/16" dia. to the 6" dia., and "B" points out the second trepanning cut from the 5¼" dia. to the 4¼" dia. Trepanning this amount of steel in one holding indicates how well P&J Tooling teams up with P&J Automatics to combine operations, combine cuts and reduce machining time. Close-up of the P&J-designed trepanning head on the 5D Power-Flex appears below.

The machining on this forged steel Ring job could make it a tough tool-engineering problem: there's considerable, time-consuming work to close tolerances on all faces on both sides, including two trepanning cuts.

Can any of these operations be combined to eliminate unnecessary work handling... can cuts be combined to reduce machine-handling time . . . can machining time be reduced to obtain the greatest possible production?

If the answers are "no", the problem remains a tough one. But the answers are all *"yes"*, because the job is done with P&J Tooling on P&J Automatics — in this case, the 5D Power-Flex.

Practical-minded tool engineers look to P&J Specialized Tool Engineering for the answers to their production problems . . . get their recommendations on *your* tough work.



P & J - PRODUCTION TOOLING HEADQUARTERS

Potter & Johnston Company

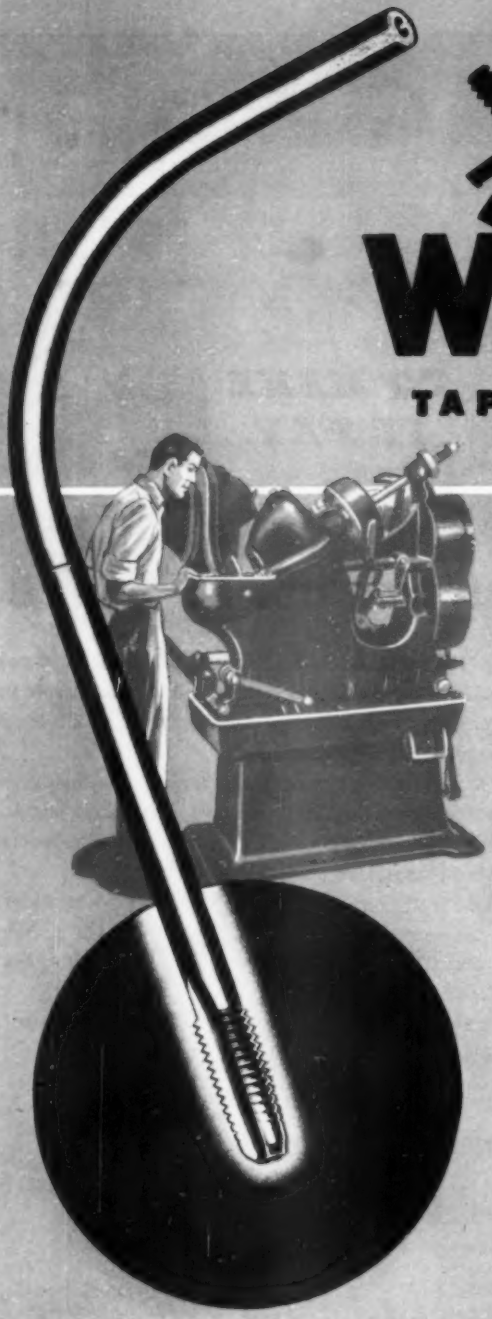
Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J

WINTER

TAPS IN ACTION



WINTER BENT SHANK TAPPER TAPS are recommended for high production threading of nuts in automatic tapping machines. They are designed with a long chamfer that makes entering the work easier, and spreads the cutting action over many teeth. For automatic ejection, the bent shank is made slightly smaller than the root of the thread, so that the finished nuts move freely over it. Winter also offers straight shank tapper taps, and a full line of other taps and dies, including hand, chip driver, machine screw, nut, pipe, pulley, and stove bolt taps.

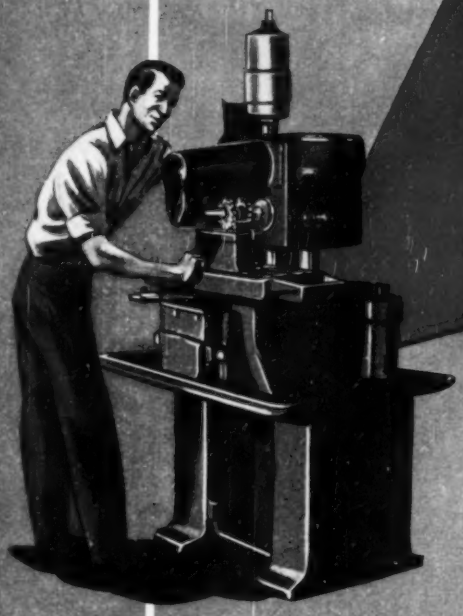
ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company

Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

NATIONAL METAL CUTTING TOOLS ON THE JOB



NATIONAL SIDE MILLING CUTTERS are recommended for straddle milling and slotting, as well as side milling. Their design provides ample space for chip removal, without loss of structural strength. For heavy duty side milling, **NATIONAL HALF SIDE MILLING CUTTERS** are recommended. They have deep spiral gashes that give the teeth a positive side rake, assuring smooth cutting action and long tool life. National makes a complete line of milling cutters, as well as other rotary metal cutting tools, including twist drills, reamers, counterbores, end mills, hobs and special tools.

CALL YOUR DISTRIBUTOR

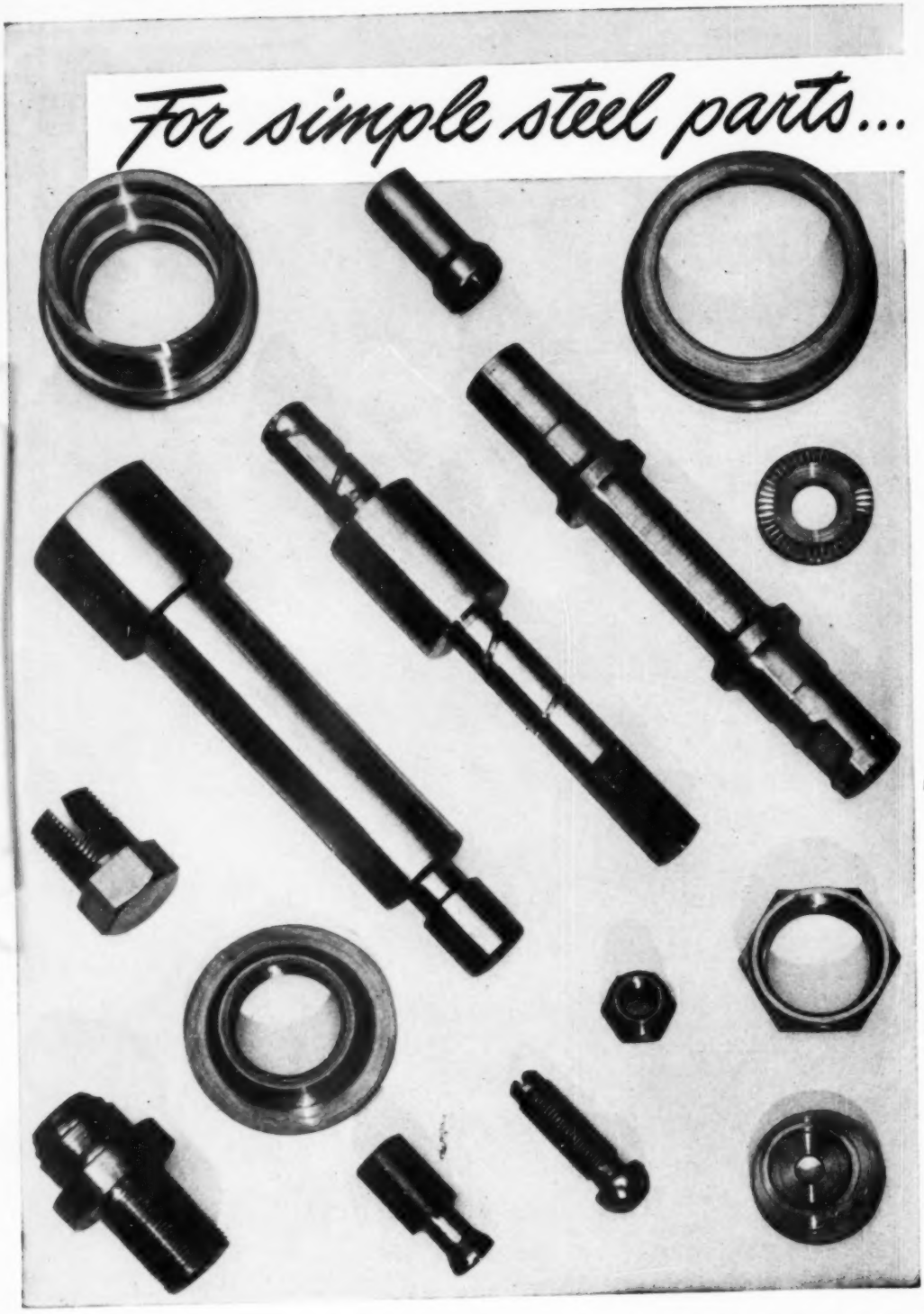
LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL cutting tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH., U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco


For simple steel parts...

...and tricky ones, too

—you need this improved

MACHINABILITY

Regardless of the design of steel parts made on a mass production basis, your spread between profit and loss is determined in most part by the MACHINABILITY of the steel bars you use.

That makes MACHINABILITY vitally important —so important that Union Drawn has spent large sums in improving it to the present high levels found today in Union Cold Drawn Steels.

For 60 years, Union Drawn Metallurgists and Engineers have been making an intensive study of the machining characteristics of various steels. They have learned much—particularly how slight changes in chemistry and processing produce marked effects on speeds and feeds, tool life and machined surfaces. Each year they cut up tons of steel on an "automatic"—and spend long hours in customers' plants observing the performance of steels under actual operating conditions.

The results: (1) an unequalled knowledge of MACHINABILITY; (2) the development of new free-machining steels; (3) a continuous improvement in all Union Drawn Products from year to year.

Whether you make simple steel parts—or tricky ones—why not take advantage of the improved MACHINABILITY in Republic Union Drawn Bessemer, carbon, alloy and stainless steels—*plus* Union Drawn's metallurgical and engineering assistance? They can mean higher production efficiency, increased output, lower unit costs and better surface quality. And remember, too, that all types of furnace treatment are available to further improve your profit picture.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • • • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

Republic

REPUBLIC STEEL

US

UNION COLD DRAWN STEELS

Free-Machining Bessemer, Alloy and Enduro Stainless Steels

•

Union Cold Drawn Special Sections

•

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting)

23 CUBIC INCHES TOUGH STEEL REMOVED IN 58 SECONDS

Using

BARBER-COLMAN

TANTUNG-TIPPED

SLAB MILLING CUTTERS

Husky cuts in tough steel call for extra stamina in cutting tools — ability to do the job at a good rate of production, without sacrificing tool life.

For example, in this brake band milling operation, Barber-Colman Tantung-Tipped Cutters remove 23 cubic inches of SAE 5140 steel *in 58 seconds*, and do it producing 250 pieces per sharpening. This is a total of 2937 cubic inches of metal removal between sharpenings. High speed steel cutters do not stand up under this fast heavy cut.

If you have a metal removal problem, whether it's to get greater production or more economical tool life, ask your Barber-Colman representative for recommendations on *Job-Engineered Cutting Tools.*

JOB FACTS

Operation — Remove ⅜" stock, 1¾" wide on brake band 7" dia.

Cutters — B-C Tantung-Tipped Slab Mills, 4½" x 4" x 1½"

Material — SAE 5140 Steel

Cutter Speed — 175 RPM

Tool Life — 250 pieces per sharp. 15-20 sharpenings

MORE DATA FREE!

Get this complete file of milling cutter performance records. Ask for File No. 4139.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 4139 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

BARBER COLMAN

THE GREENFIELD STORY

of Service and Quality

"Acorn"

THE coming of mass production called for a new type of die which could be operated at high speed on machines. *The "Acorn" Die has proved to be the answer.*

The "Acorn" Die is simple in design. Shaped like an acorn, it is held in holders which fit any machine. A screw cap gives quick, accurate adjustment. The "Acorn" Die is today, as it has been since 1909, the most popular production die on the market. Through the years, "Greenfield" threading engineers have added several refinements of design, but the principle is still the same — a tool that has made a major contribution on production lines in war and in peace.

The complete story of the "Acorn" Die is yours for the asking. Just ask your local "Greenfield" Distributor, or write direct.

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

and

GTD AMPCO

AMPCO TWIST DRILL CORP. ★
Jackson, Michigan

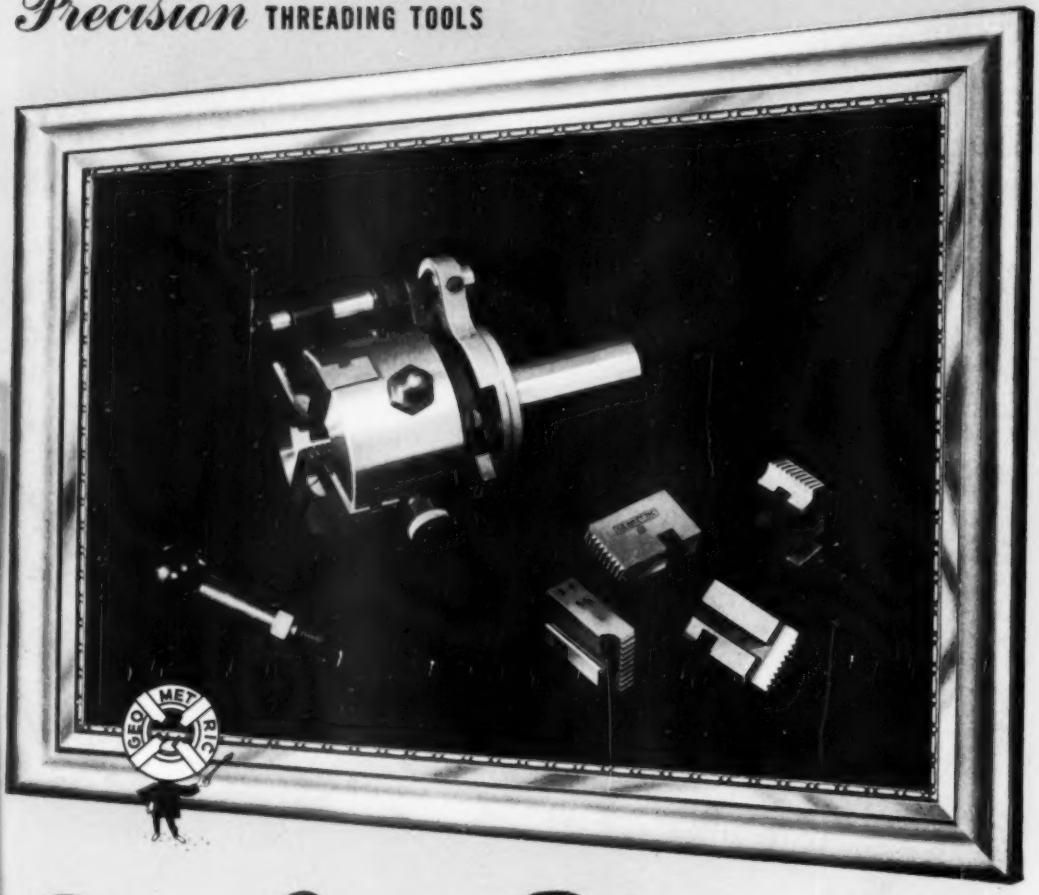
Divisions of Greenfield Tap and Die Corporation

GTD

GREENFIELD

Be Sure
Buy "Greenfield"

Precision **THREADING TOOLS**



New Aligning Shank

Style DS Die Head and Chasers

Quick adjustment to compensate for misalignment when threading . . . an optional feature that has been added to the Convertible DS Die Head.

* *

Available in 5/16", 9/16" and 3/4" sizes.

* *

GEOMETRIC also makes a complete line of Rotary and Stationary Self Opening . . . and Solid Adjustable Die Heads—Collapsing . . . and Solid Adjustable Taps—and GEOMETRIC Chasers.

"Be Sure . . . Buy Geometric"

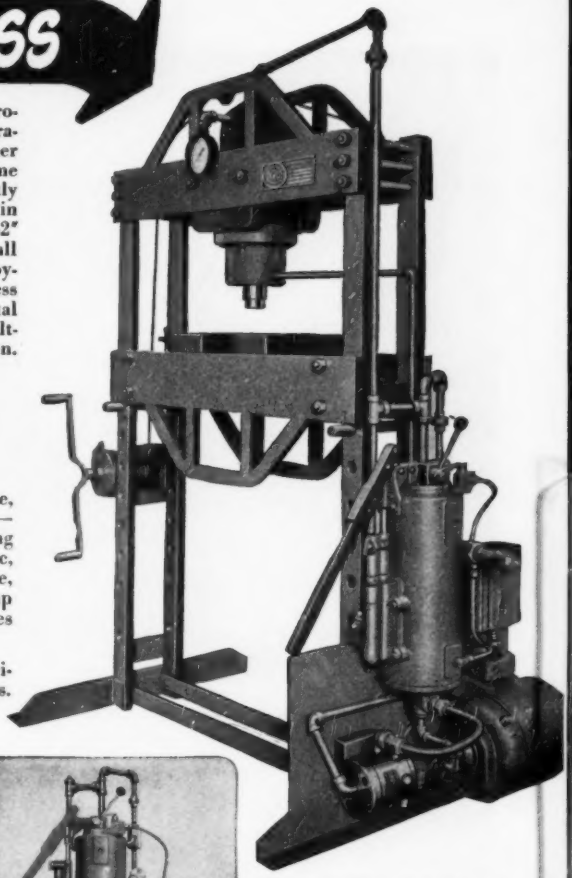
THE
GEOMETRIC
TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

GTD

GTD AMPCO

LOOK AT THIS PRESS

It's designed to provide industry with low-cost, high production units that are highly flexible in design and operation . . . relieving heavier presses of short runs and lighter work. Presses are practically fool-proof in operation. Frame is extremely rugged. Fingertip controls are conveniently located at hand level. Available for immediate delivery, in standard width (between uprights) of 24"—31"—36"—42" respectively. Available in special width up to 72" at small additional cost. Movable bed plates. Pumping unit has by-pass relief valve which can be set at any pressure up to press capacity. Presses available for either vertical or horizontal operation. *All Standard* presses equipped with 2-speed built-in hand pumps for more sensitive and versatile operation.

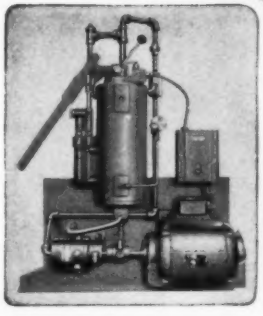


READ THESE "SPECS":

CYLINDERS: *Standard Models* furnished with 6" bore, 7½" stroke—spring return type; also 5" bore, 7½" stroke—spring return type. Above presses are *standard*. Following can be furnished at additional cost: Double Acting, 6" bore, 7" stroke; 6" bore, 11" stroke; 5" bore, 7" stroke; 5" bore, 11" stroke. Special long stroke cylinders also available, up to 48" in length, for incorporation in suitable press frames of our make.

PUMPING UNITS: These units can be supplied in various volumes and pressures, in a total of 13 combinations.

Presses include V blocks, Gauge, Motor Controls, Pressure Regulator, etc., complete and ready to attach to electrical source.



MODERNIZE AND MOTORIZE YOUR PRESENT KRW PRESS with one of these compact motor drive units. They come complete ready to connect to your press. Require very little extra floor space. Write for conversion unit prices, giving the capacity and serial number of your press.

CHECK THESE USES:

There are so many everyday production uses for these versatile KRW Hydraulic Presses that we have lost count. Here are a few of the more obvious . . . blanking, forming, bending, broaching, straightening, stamping, embossing, numbering, upsetting, laminating, pressing and hot or cold forging. KRW Engineers are daily developing other uses. If you have only a vague idea of how these presses might be used in your plant, let us have it in a rough form. We'll do the rest.

BEAT THESE PRICES*:

Depending upon capacity of pumping equipment, prices of Standard model motor driven hydraulic presses are as follows, F. O. B. Factory: 25-ton press from $727.00 to $992.00. 50-ton press from $806.00 to $1058.00. 60-ton press from $1070.50 to $1135.00. 75-ton press from $1198.00 to $1258.00. All motors in the above units are 220/440 volt, 3 phase, 60 cycle. Any change in motor specifications is extra. **Subject to change without notice.*

MAIL THIS COUPON

It will bring you all the money-saving facts about these low cost, high production hydraulic presses. Now is the time to get ready for the highly competitive days ahead.

K. R. WILSON, 215 Main St., Buffalo 3, N. Y.

Please send me complete information on KRW Motor Driven Presses as follows:

☐ 25-ton ☐ 50-ton ☐ 60-ton ☐ 75-ton presses

☐ motor drive conversion unit ☐ Press Cap.

Serial No. .....

Name .....

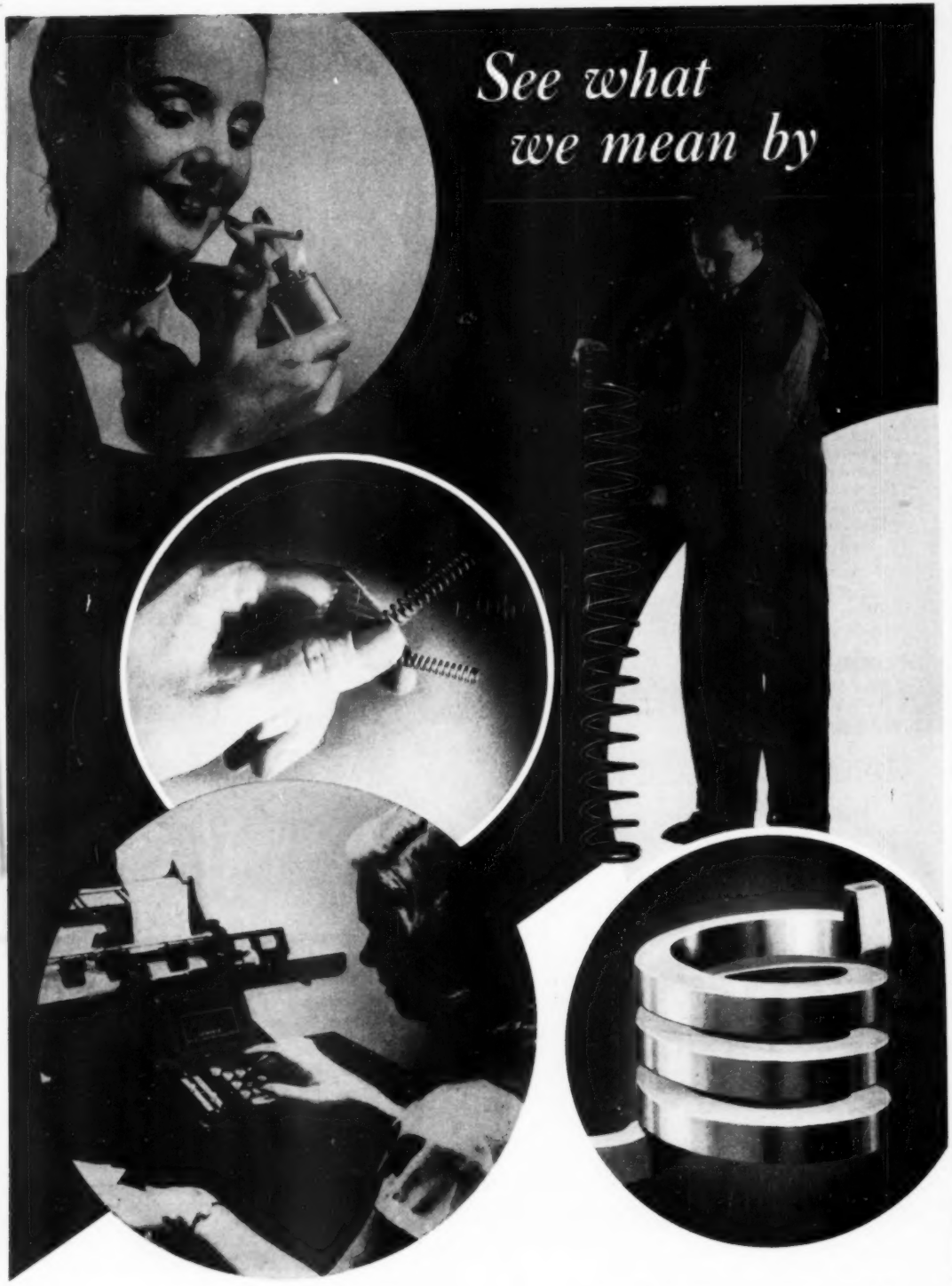
Address .....

City and Zone ..... *State* .....

11

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.


See what
we mean by

"Springs for every need?"

● You're looking at some of the reasons why one of our spring men recently said—"We make springs for just about everything that uses springs!"

But we take far more pride in the *quality* of our American Quality Springs than we do in the quantities we produce. That's why it has long been our policy to keep top-drawer spring men on our payrolls . . . and to have the very best spring-making equipment in our plants. These men . . . this equipment are your assurance that American Quality Springs will meet the high standards that have for years characterized *all* of our wire products.

In the matter of design, too, we feel fully qualified to offer you assistance. Our engineers have designed springs to do everything from releasing mousetraps to minimizing shock in bulldozers.

These widely-varied jobs have given them a deep reservoir of useful knowledge which may contain the right answer to some ticklish spring problem of *yours*.

So for design, for production, and for greater peace of mind about performance, why not call, write or wire us?

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS **AMERICAN QUALITY SPRINGS**

UNITED STATES STEEL

A "Multi-Dividend" Investment
for production milling of small parts

THE VERSATILE No. 000 PLAIN MILLING MACHINE

THIS modern, manufacturing-type milling machine is a glutton for work. It is highly efficient and adaptable to all types of small milling operations. It produces work of consistently-uniform accuracy and finish and operates at an extremely rapid, economical rate. In nearly every plant there are plenty of jobs to keep the Brown & Sharpe No. 000 busy . . . continuously . . . assuring multi-dividends from the investment, over a long period of time.

Get the advantages of low-cost, high quality milling on small pieces such as parts for sewing machines, radios, industrial instruments, business machines and similar products. Collect "multi-dividends" on your investment in milling equipment. Send for the No. 000 illustrated Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

No. 000 DIVIDEND FEATURES

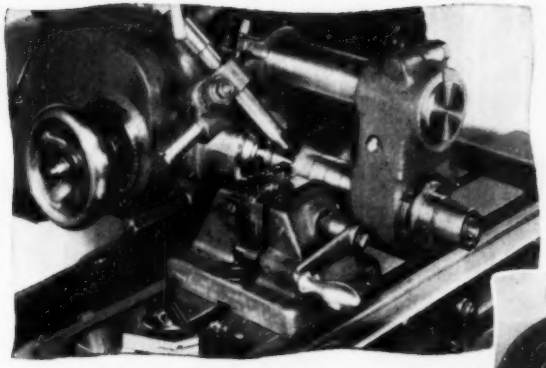
for consistent accuracy and finish

- 16 changes of spindle speed, 105 to 3540 R.P.M., suitable for milling a wide range of materials—extra high speed range available.
- 16 rates of feed from 9/16" to 24⅝" per minute—with full automatic operation.
- Direction of spindle rotation can be set by switch. With intermittent operation, spindle stops when table stops . . . to assure safety in loading.
- Table reversal accurate to .002" . . . particularly advantageous in making blind cuts.

for fast production rate

- Extremely rapid fast-travel movement.
- Work can be safely advanced at fast travel close to cutter.
- Wide range of feeds permits fast efficient milling on a variety of materials.
- Automatic cycle reduces operator fatigue and non-cutting time to minimum — often permits operator to load work with both hands.
- Simple, fast set-ups.

BROWN &

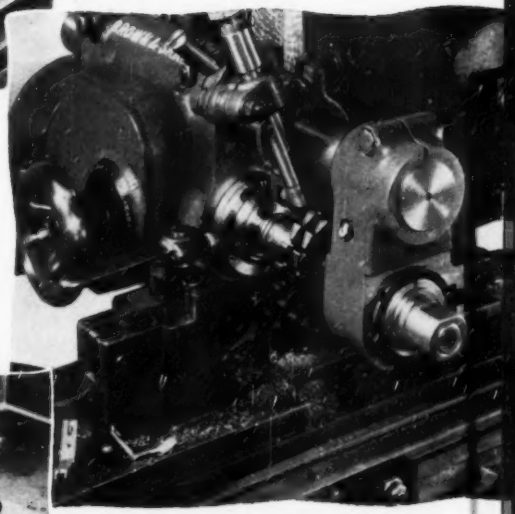


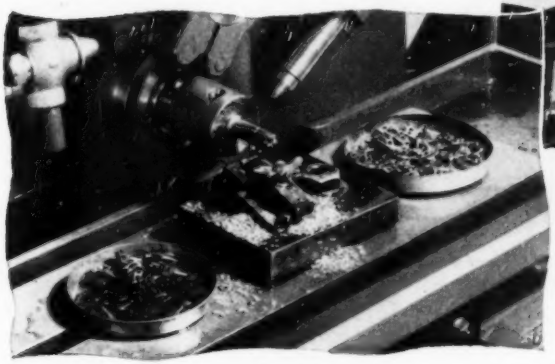
A Dividend of Accuracy ▲

Consistent accuracy of table reversal . . . to .002" . . . assures uniform depth of slot in this blind cut.

A Dividend of Speed ▼

Rapidity of table movement permits taking light, short cuts practically as fast as operator can load and unload fixture.





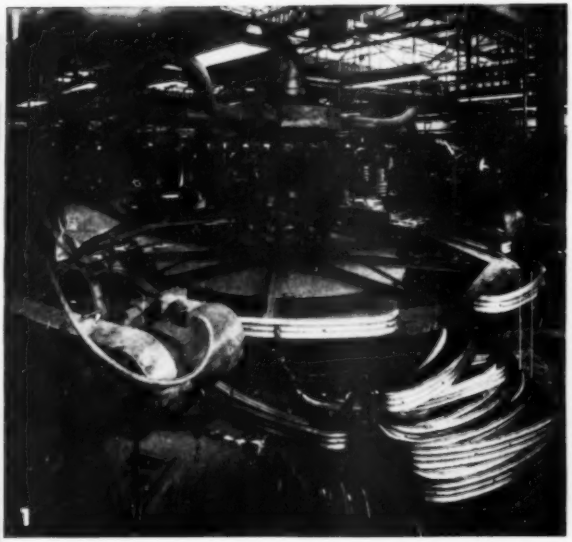
A Dividend of Versatility ▲

Broad range of spindle speeds permits efficient use of comparatively large cutters down to the smallest end mills.

SHARPE

B·S

. . . OSBORN FASCUT® POWER IMPROVE AUTO BUMPER



Above, photo 1: Rotary machine equipped with Osborn Fascut Brushes. Machine turns clockwise as brushes polish top edge of bumpers. Upper right, photo 2: Close-up of Fascuts on rotary machine applying final brushing operation to top edge of bumpers.

THE Auto-Lite plant at Sharonville, Ohio, is one of the world's largest producers of steel bumpers for motor cars.

By means of new finishing techniques, involving the use of *Osborn Fascut® Power Driven Brushes*, the company is mass producing auto bumpers with a satin-smooth high lustre finish that is extremely rust-resistant.

After forming, the bumpers are conveyed to a rotary machine equipped with Osborn Fascut Power Brushes. Here, metal pit marks and surface imperfections are brushed away and the bumpers prepared for subsequent plating.

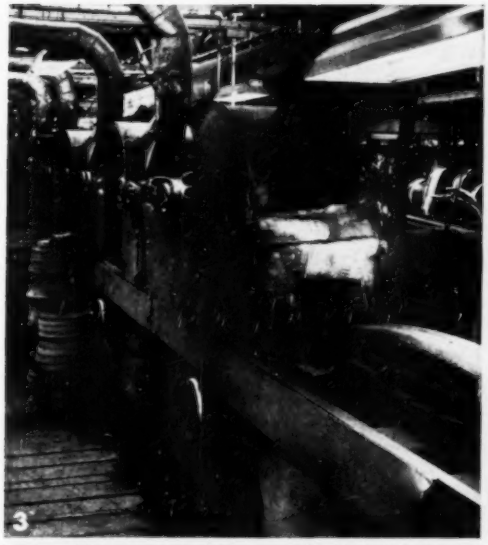
According to Company officials, the use of Osborn Fascut Power Driven Brushes results in fewer 'rejects' and reduces production costs.

The finishes on your metal products can be improved by the use of one or more of Osborn's complete line of cost cutting Power Driven Brushes. Contact us today.

Dept. 178, 5401 Hamilton Avenue

THE OSBORN MANUFACTURING COMPANY
CLEVELAND 14, OHIO

BRUSHES REDUCE 'REJECTS', FINISH FOR AUTO-LITE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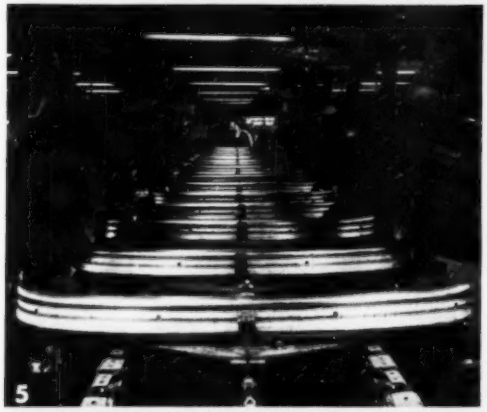
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Upper left, photo 3: An in-line polishing machine equipped with Osborn Fascut Power Brushes applying finish to face of the bumpers. Upper right, photo 4: Close-up of one of several Fascuts used with an in-line polishing machine. Lower left, photo 5: General view of "end" machine polishing curved ends of Auto-Lite bumpers.

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY
POWER DRIVEN BRUSHES • PAINT BRUSHES • MAINTENANCE BRUSHES

KEARNEY & TRECKER
MILWAUKEE

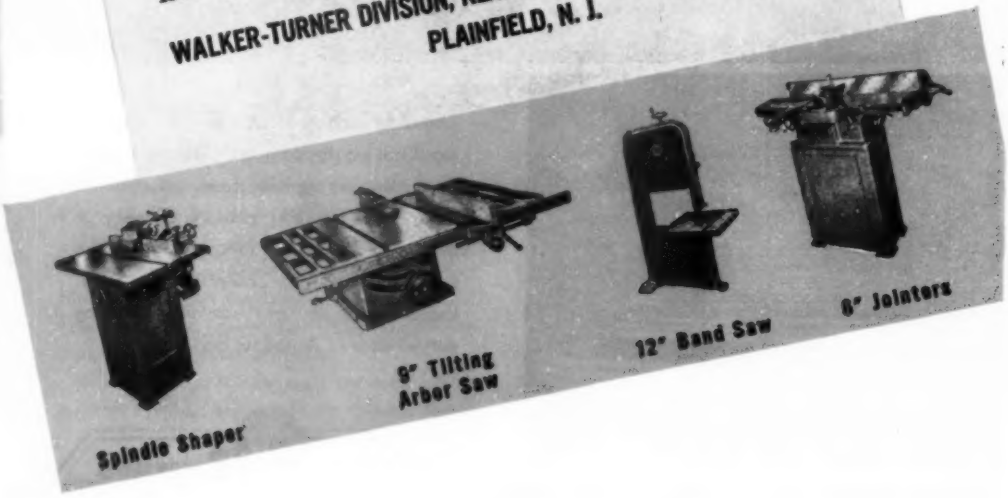
walker-Turner

51 YEARS OF LEADERSHIP PIONEERING IN PRECISION MILLING MACHINES • BORING MACHINES AND SPECIAL EQUIPMENT...

28 YEARS OF LEADERSHIP IN LIGHT MACHINE TOOLS VOLUME PRODUCTION • HIGH QUALITY AND POPULAR PRICES...

Combining the experience of two pioneer organizations and their affiliated research, manufacturing facilities and know how—the Walker-Turner Division at Plainfield, N. J. is now supplying light machine tools of ever-increasing standards of performance, long life, and trouble free operation.

WALKER-TURNER DIVISION, KEARNEY & TRECKER CORPORATION
PLAINFIELD, N. J.



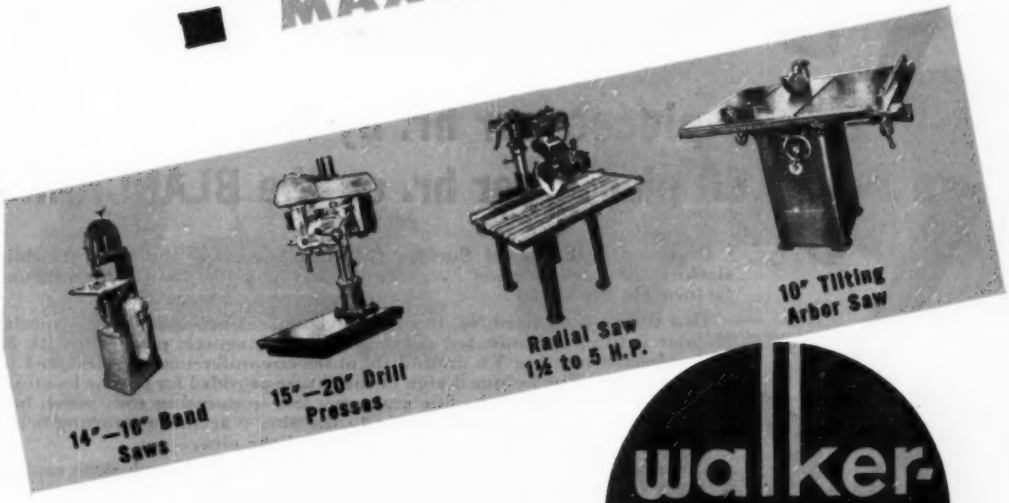
RADIAL SAWS • BAND SAWS • DRILL PRESSES • TILTING ARBOR SAWS • JIG SAWS • TABLE SAWS • JOINTERS • LATHES • BELT AND DISC SURFACERS

■ SOUND POLICIES

■ IMPROVED FACILITIES

■ NEW DESIGNS

■ MAXIMUM VALUES



walker-Turner
DIVISION
KEARNEY & TRECKER CORP.
PLAINFIELD, N. J.
U. S. A.

NEW CATALOG

The first of several new catalogs in process is now ready for distribution, write now for your free copy . . . All the latest models are fully described, the complete Walker-Turner line is illustrated. A post card will bring your copy by return mail, or ask your dealer for a copy. *Walker-Turner Machine Tools are sold only through Authorized Dealers.*

20 pieces per hr. by former method
180 pieces per hr. on the BLANCHARD

Once again Blanchard Surface Grinding increases part output while slashing production costs . . . today's best formula for putting manufacturers in the black.

This time a Blanchard No. 18 with a magnetic chuck was used. A special circular fixture, of laminated construction for magnetic purposes, with 39 spring-loaded locating V's around its outer circumference was designed to hold the work. The unique design of the fixture provided for precise locating, aligning and holding of the fine grain cast iron connecting rods which had to be ground flat and at right angles to the pins — accurate finishing being essential to a later hollow milling operation of the pins.

The combination of the Blanchard's ability to remove stock more rapidly to exact tolerances and the clever holding fixture stepped up production to 180 pieces per hour as against 20 per hour by best other production method.

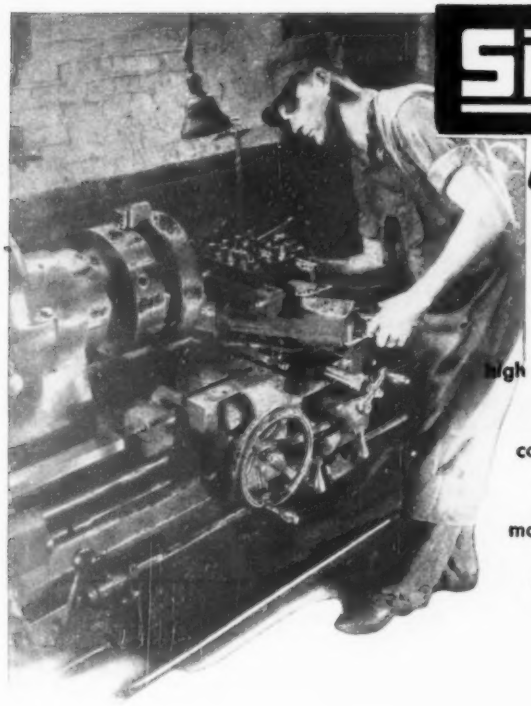
Here are the part details:

Length of base overall $7\frac{1}{4}$", width of base—$\frac{7}{8}$", thickness of base before grinding—$\frac{7}{16}$", overall length of pins—$1\frac{3}{4}$", rough diameter of pins—$\frac{7}{8}$", finished diameter of pins—$\frac{3}{4}$". Material removed $\frac{1}{16}$" on major portion of base and two cross lugs $\frac{1}{16}$" additional.

Send for your free copies of "Work Done on the Blanchard", third edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

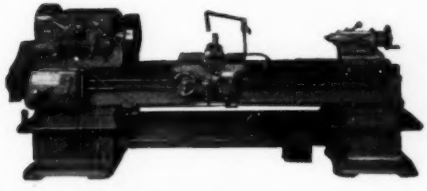


SPRINGFIELD

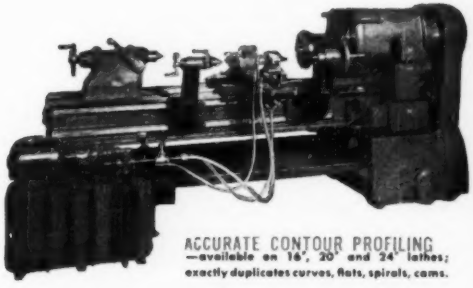
Geared Head LATHES

Springfield builds a complete line of precision, high quality, geared head lathes. Every type of lathe built by Springfield is especially designed and constructed to meet all the requirements of modern tooling, and to retain extreme accuracy through many years of full capacity production.

Write for catalogs and detailed specifications.

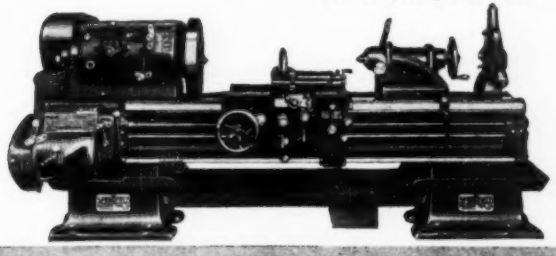


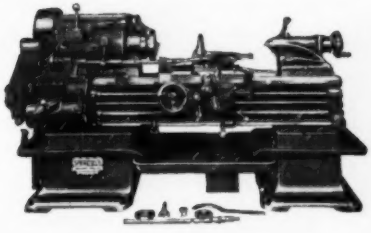
MANUFACTURING LATHE
—with unusually wide applications; capable of accurately turning, boring and facing.



ACCURATE CONTOUR PROFILING
—available on 16", 20" and 24" lathes; exactly duplicates curves, flats, spirals, cams.

SUPER DUTY LATHES
—made in 20" and 22" sizes; equipped with 16-speed geared heads.





TOOL ROOM LATHES
—made in all sizes including 24"; equipped with lead screw reversing mechanisms.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

Exclusive Representatives in All Principal Cities

UNBRAKO

SOCKET CAP SCREW WITH KNURLED HEAD

...SLIP-PROOF HEAD
...EXTRA STRONG
...MADE TO CLOSE TOLERANCES

There is a definite saving of assembly time when you use "UNBRAKO" Socket Head Cap Screws with Knurled Heads. The exclusive knurled heads perform a triple duty: (1) the *knurling* provides a sure, slip-proof grip; (2) the *knurling* permits positive locking—a feature so often essential where there is excessive impact or vibration; (3) the *knurling* speeds assembly, because it enables the "UNBRAKO" to be screwed in easier, faster, and further with the fingers—handiest of all wrenches—before a "key" becomes necessary.

As always, the name of "UNBRAKO" signifies *extra strength* and *precision manufacture to close tolerances.*

"UNBRAKO" Knurled Socket Head Cap Screws are available in sizes from #4 to 1½" diameter, and in a full range of lengths. Write for your free copy of the "UNBRAKO" Catalog and the name of your nearest "UNBRAKO" Distributor.

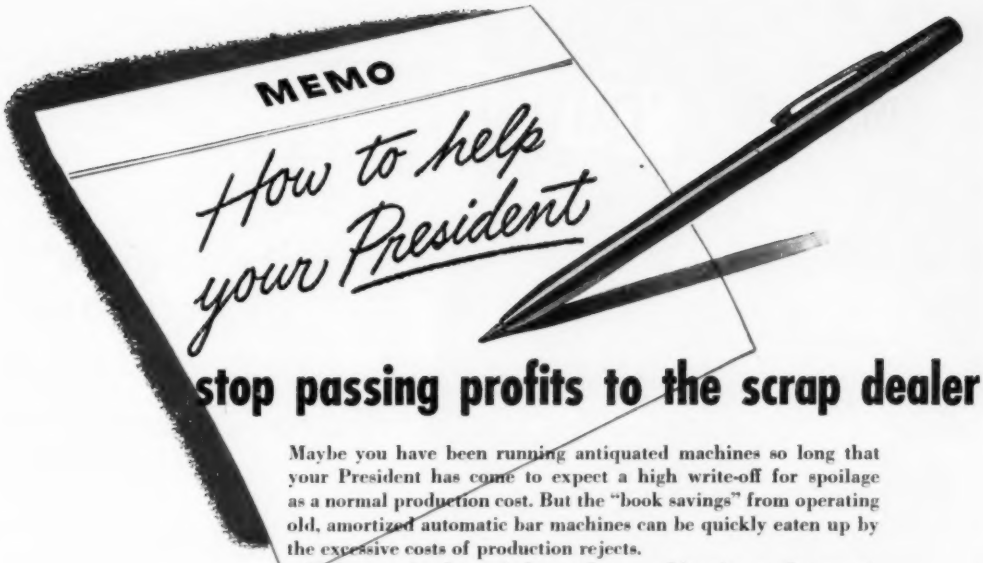
Knurling of Socket Screws originated with "Unbrako" in 1934.

Other "UNBRAKO" Products include:
Socket Set Screws with Knurled Cup Points, Socket Set Screws with Knurled Threads, Square Head Set Screws with Knurled Cup Points—all patented, self-locking screws that won't shake loose! Socket Head Stripper Bolts. *Precision-Ground* Dowel Pins. *Fully-Formed* Pressure Plugs.

SPS STANDARD PRESSED STEEL CO.

BOX 4 JENKINTOWN, PENNSYLVANIA

"Serving Industry continuously since 1903 through Industrial Distributors"



stop passing profits to the scrap dealer

Maybe you have been running antiquated machines so long that your President has come to expect a high write-off for spoilage as a normal production cost. But the "book savings" from operating old, amortized automatic bar machines can be quickly eaten up by the excessive costs of production rejects.

Perhaps a simple reminder—a few case histories on the experiences of some of our customers—will demonstrate to your top executives how the new Acme-Gridley Automatics can "up" your production profit.

We would be glad to send you more of these actual performance records, if you like—or prepare a specific machine recommendation to fit your individual needs.

CUT THIS OUT FOR USE WHEN YOUR PRESIDENT WANTS PROOF

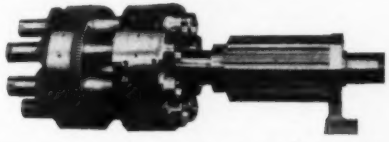
AN ACME-GRIDLEY CERTIFIED CASE STUDY

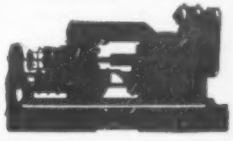
THIS IS WHAT HAPPENED:

MACHINE—2" RB-6 Spindle Acme-Gridley Bar Automatic
PART TURNED—Sewing Machine Shuttle Blank
MATERIAL—SAE 1112 Bar Stock
OPERATIONS—20, including pick-off and shaving back radius
TOTAL TIME PER PIECE—23 Seconds
TOLERANCE—.002" between stem and inside wall

AND HERE'S ONE IMPORTANT REASON:

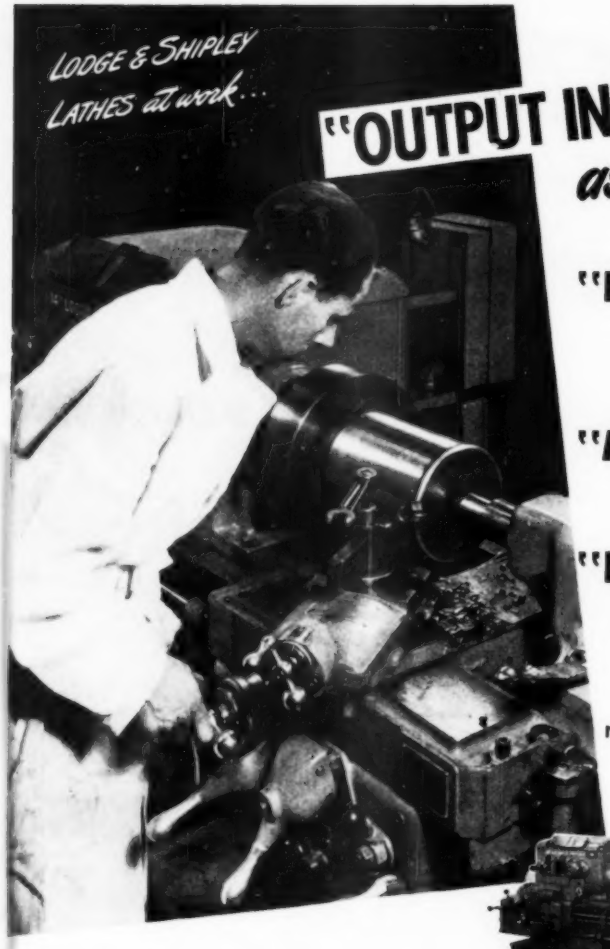
ACME-GRIDLEY SPINDLE CARRIER, designed with bearing surfaces two-thirds the length of headstock housing. A heavy bearing in the gear box section and the guide-arm, both supporting the stem end, provide a three-point bearing for the carrier system. This rigid support is a basic reason for sustained accuracy under heavy duty service. Carrier and stem are concentrically ground, by an exclusive National Acme process, at one setting—to give basic positive alignment, for greater machining accuracy. The forged end tool sides are mounted around this hardened stem. Permanent alignment of the tools with the work is one of many important reasons for the precision, speed and long life of Acme-Gridley Automatics.





ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

THE NATIONAL ACME COMPANY
170 EAST 131st STREET • CLEVELAND 8, OHIO



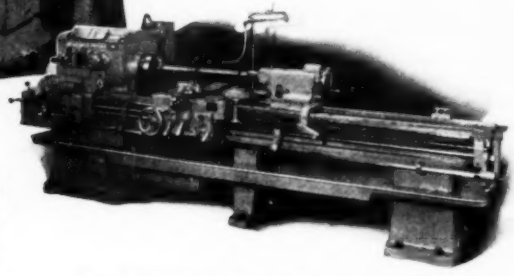
"OUTPUT INCREASED 100%" as high as

"Higher degree of accuracy"

"More versatility"

"Best lathe on the market"

reports **HUFFORD MACHINE WORKS Inc.**
Redondo Beach, California



THIS NOTED MANUFACTURER of precision hydraulic equipment is constantly concerned with greater accuracy and increased output. And their enthusiastic choice is Lodge and Shipley for "lathe work requiring a high degree of accuracy at a high production rate."

Illustrated is the new Model "X" 14" Engine Lathe in the plant of Hufford. Their careful evaluation of the detailed features of this lathe points out its superior design.

This firm finds their Lodge and Shipley lathe has excellent, profitable features: "Unusual Horsepower Capacity, Slide Rule Calculator to eliminate tedious calculations, Hardened Steel Bedways, Totally Enclosed Quick Change Gear Box, Tail Stock Quick-Acting Clamp, Apron Feed and Thread Interlock, and Heavier, More Rugged Design."

Add these features up and you get the extraordinary profit-making performance Hufford reports.

This data reflects the experience of many thousands of Lodge and Shipley Lathe owners. Set new standards of production and profit. Call in a Lodge and Shipley representative for complete analysis of your lathe work and write for Bulletin No. 679.

THE **Lodge & Shipley** COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

New Texrope Sheave Gives Lowest Cost

Instant Speed Control

- Covers most speed changing needs from 3 to 20 hp
- Very simple — one sheave does all
- Infinitely variable speed — 100% increase; 2 to 1 range.

THE NEW *Vari-Pitch* AUTOMATIC SHEAVE is the simplest, most economical method of instant speed control ever devised. You just move the motor forward to increase speed and move the motor back to decrease. The *Vari-Pitch* Automatic Sheave changes pitch diameter and holds the belts at proper tension *automatically*.

Now, you can cut unit costs by operating machines at most efficient speed . . . improve quality by compensating for material variation . . . with a very small investment in new equipment. Today, ask your A-C Authorized Dealer or Sales Office to give you complete facts and figures on how the new *Vari-Pitch* Automatic Sheave can save money in your plant. Or write for bulletin 20B7223. A-2767

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS

Here's Technical Co-operation to Help You Produce . . . MORE . . . BETTER

Information pertaining to the type of coated abrasive products . . . suggestions as to changes in methods and equipment to turn out better work at increased production rates . . . specifications relating to the abrasive action—all are helpful to production management. Such information is equally helpful to supervisors and operators of sanding and finishing equipment in producing *more work . . . better.*

Carborundum's Technical Service is available to all industrial plants and the Company's Abrasive Engineers always welcome an opportunity to supply helpful information. Your product may be tested in Carborundum's Demonstration Laboratories on the latest, most up-to-date equipment . . . by the most modern methods . . . by abrasive engineering experts who are thoroughly informed in the most recent, efficient trends.

Carborundum's technical service and the facilities of the Demonstration Laboratories are available without charge to manufacturing organizations with production or finishing problems.

10 Important Points are Observed in Carborundum's New, Modern Services

Check them against your own requirements for increased productivity and lower costs:

1 INCREASED PRODUCTIVITY is specified for all abrasive products in Carborundum's line. Backed by skilled, experienced personnel and the most modern of factories, these coated abrasives are devised to produce *more . . . better.*

2 DECREASED COST is an additional factor of modern production recognized by the staff manufacturing and distributing Carborundum's line of Coated Products. Through better performance, these products play their part in reducing the manufacturer's production costs.

3 EFFECTIVE TECHNICAL ASSISTANCE is essential to practical, profitable utilization of the best in abrasive tools . . . and Carborundum's Coated Abrasive Engineers—at the home office and in the field—have the "know-how" and experience to render timely and helpful co-operation to the customer's production staff.

4 IMPROVED PRODUCTS bring better results in terms of increased output and lower unit costs. For this reason, Carborundum's technical staff and laboratory equipment are busy round the clock . . . checking and improving materials and manufacturing methods.

5 CONSISTENT HIGH QUALITY in coated abrasive products helps keep the sanding or finishing operation running smoothly . . . *all the time.* Technical and manufacturing operations in Carborundum's new plant are co-ordinated and controlled in order to produce this essential consistency in the quality of every product.

6 DEPENDABLE PERFORMANCE means assurance that the product will live up to its reputation—give the service required by the user. Therefore, Carborundum's entire Coated Products Division organization is pledged to maintenance of the highest standards in both product quality and service.

7 COMPLETE, ADEQUATE STOCKS are essential in order to have Coated Abrasive Products *wherever* they are needed—*whenever* they are needed. These requirements are met by Carborundum's vast stocks at the main plant and in the District warehouses.

8 TIMELY DELIVERIES result when stocks are complete and adequate in quantity . . . and when they are strategically located as are Carborundum's. Solid sales service at all levels helps, too.

9 EFFICIENT ORDER HANDLING means processing, routing, and delivering the customer's order promptly and efficiently. Carborundum's sales organization follows this principle of order service from the home office through every District, Distributor, and Jobber organization.

10 HELPFUL PURCHASING SERVICE is transmitted to the user of coated abrasive products by Carborundum's competent, experienced, thoroughly informed staff of salesmen, field engineers, and Distributors' and Jobbers' representatives.

TRY THIS new service. Every effort will be extended to help your Company obtain better, less costly production rates with the use of coated abrasive products. Address your inquiry to The Carborundum Co., Niagara Falls, N.Y.

COATED ABRASIVES BY

CARBORUNDUM

TRADE MARK

BELTS • SHEETS • ROLLS • DISCS

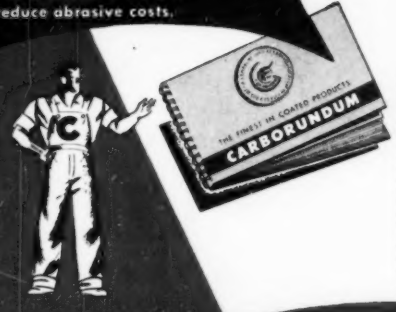
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

CARBORUNDUM'S DEMONSTRATION LABORATORIES DEVELOP SANDING AND FINISHING ANALYSIS

An extensive line of the newest machines is maintained in CARBORUNDUM'S testing and demonstration laboratory. Manufacturing organizations are invited to submit their products, production data, and finish required, for testing by the most recently developed methods.

Send for this
NEW BOOK!

It will inform you of the facilities and services that will help you produce more work . . . reduce abrasive costs.



● FILL IN THIS HANDY COUPON
insert in an envelope and MAIL TODAY
—you will receive your copy promptly.

THE CARBORUNDUM COMPANY
Niagara Falls, New York

Please send me your new book on how to produce more work and reduce abrasive costs.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

How this spindle gets precision... right on the nose

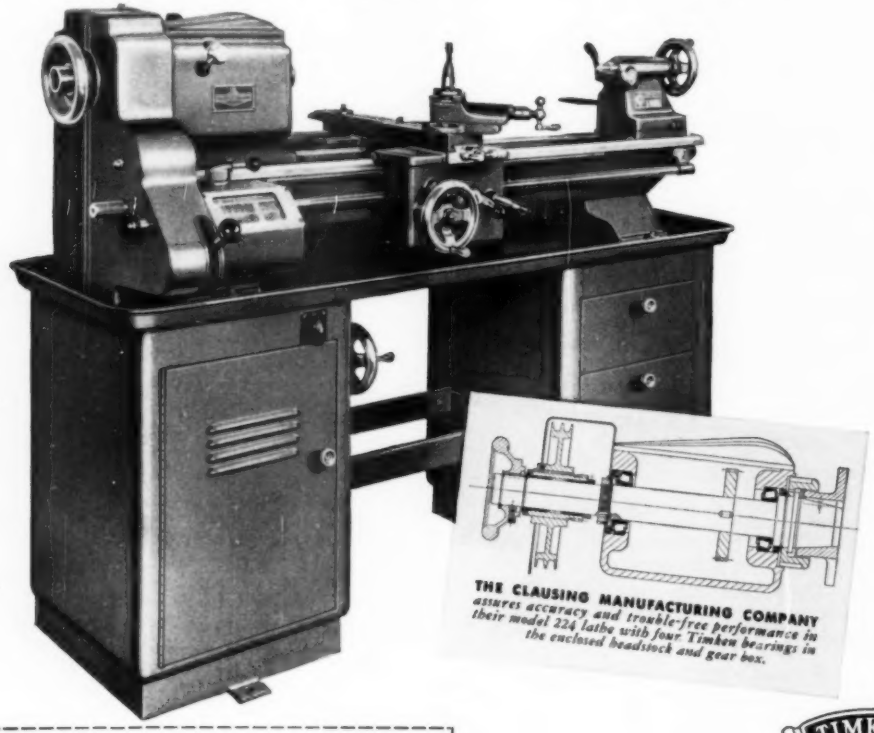
SPINDLE rigidity and precision are assured in this Clausing Model 224 lathe by mounting the spindle on Timken® precision tapered roller bearings. Two additional Timken precision bearings are used in the gear box—further assurance of accurate, dependable operation.

Due to line contact between rolls and races, Timken bearings give the spindle and other headstock shafts rigid support with no deflection. The tapered construction of Timken bearings enables them to carry both radial and thrust loads in any combination and permits pre-loading of spindles to any desired degree. End-movement is eliminated.

The rolls and races of Timken bearings are made of the finest steel ever developed for tapered roller bearings—Timken fine alloy steel—and case hardened to give unusual resistance to wear. Timken bearings are manufactured to incredible limits of accuracy and finished to extreme smoothness. Friction is virtually eliminated.

With a background of fifty years of bearing research and development, Timken bearings are the first choice throughout industry. No other bearing can bring you *all* the advantages you get with Timken bearings. Look for the trade-mark "Timken" on every bearing you buy or use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



THE CLAUSING MANUFACTURING COMPANY *assures accuracy and trouble-free performance in their model 224 lathe with four Timken bearings in the enclosed headstock and gear box.*

TIMKEN BEARING CAPACITY RATINGS INCREASED 25%

Since Timken bearings were last re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

TIMKEN

TAPERED ROLLER BEARINGS

TIMKEN 1899 50 1949 YEARS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◐ AND THRUST ◐ LOADS OR ANY COMBINATION

...choose from this Complete Line of

MORSE REAMERS

EVERY HOLE IS CUT TO EXACT SIZE when Morse Reamers do the job... and when adequate metal is left in the hole. For Morse makes reamers with flute-area wide and deep enough to clear chips freely... with no galling or scoring of the surface.

And Morse makes *all types* of reamers, for use in ferrous or non-ferrous metals... and in all sizes, from the smallest up to the huge, husky tools used in bridge and structural work. Straight flutes are furnished for general use. But where you need smooth, shear-cutting performance (as in taper pin reaming) spiral-fluted types should be specified. Let your Morse-Franchised Distributor advise you... he's a practical expert on *all* Morse Cutting Tools.

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

Accuracy, Quality, Uniformity: the MORSE Code of Cutting Tool Manufacture

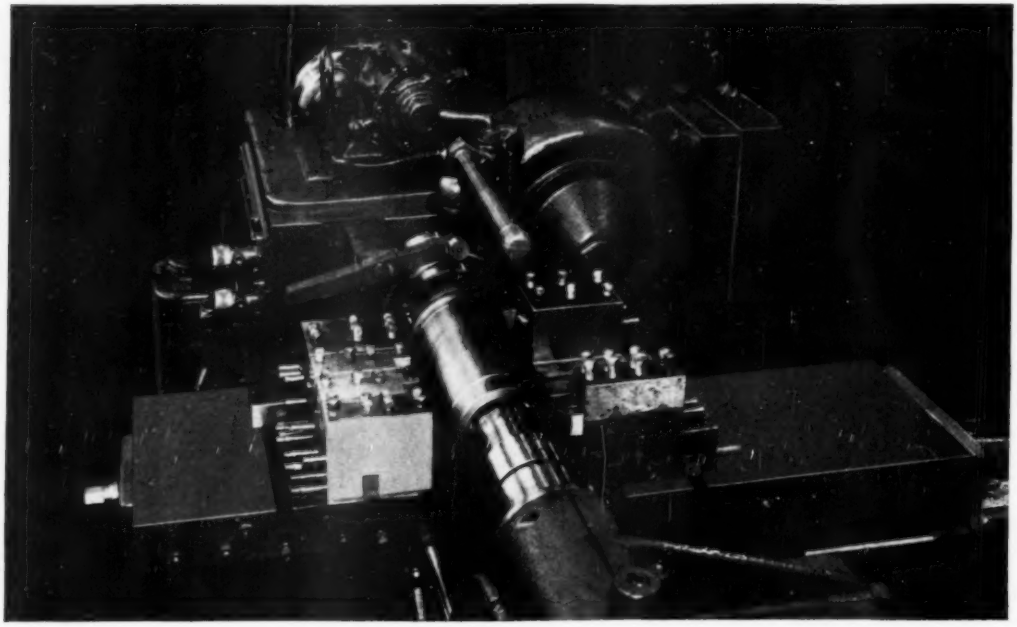
MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

CYLINDER LINERS:



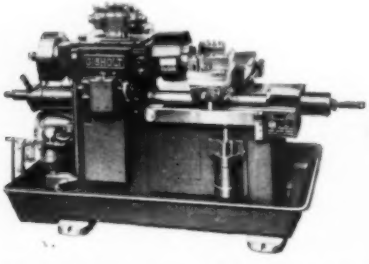
17 different sizes on One Automatic Lathe

THE GISHOLT No. 12 HYDRAULIC

You wouldn't expect an automatic lathe to handle such a wide variety of work as this—unless you know the Gisholt No. 12 Hydraulic.

This versatile automatic lathe handles 17 different sizes of cylinder liners ranging from 6½″ to 13″ in length and from 3″ to 5″ in diameter. The work is chucked on expanding arbors with interchangeable pads, while the front and rear tooling is mounted in standard, interchangeable tool blocks. This arrangement provides exceptional flexibility and a facility to quickly change over from one job to another.

When you can handle as many different sizes of parts on *one* automatic lathe—and cut both machining and set-up time—you're *bound* to cut your costs.

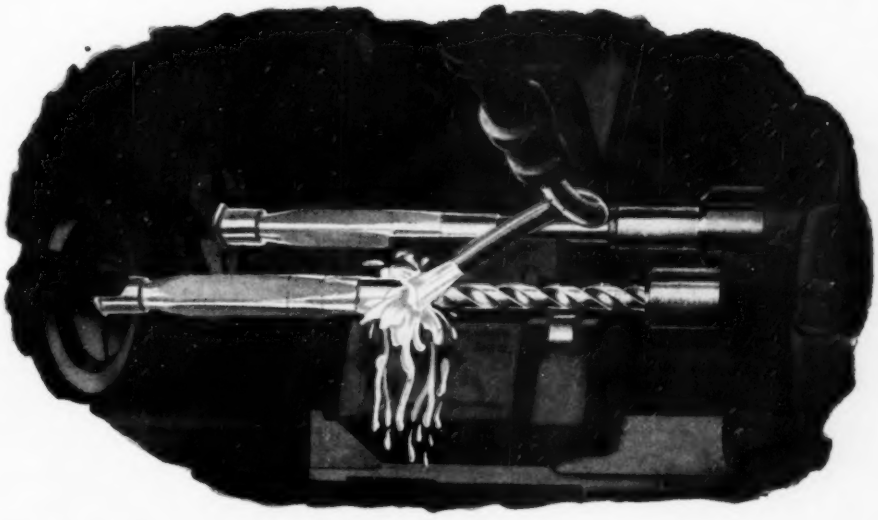


GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Gisholt No. 12 Hydraulic Automatic Lathe—a rugged 12″ lathe that combines speed and accuracy with easy set-up — unique among automatics.

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



DEEP-HOLE DRILLING IN ALCOA ALUMINUM

You'll scrap fewer parts and save machine time when you use good, deep-hole drilling procedure.

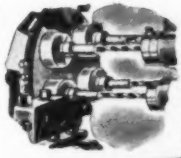
Deep-hole drilling can be done in any of the Alcoa Screw Machine Alloys. However, if drilling is the primary consideration, choose 17S-T4. It's best for the job.

Use a straight flute drill, for average deep-hole drilling. In 24S-T4 and 61S-T6 alloys, use either a high or slow spiral drill. All three have wide flutes that readily pass up the chips. For very deep holes, use half round drills. Use a standard drill for the first entry to about three drill diameters, then follow with the half round drill. This procedure insures good support for the half round drill.

An entire chapter of the free booklet, "Alcoa Aluminum in Automatic Screw Machines" is devoted to drilling. Ask for your copy at your nearby Alcoa sales office. And remember to draw on Alcoa's 60 years of aluminum experience. ALUMINUM COMPANY OF AMERICA, 1709J Gulf Building, Pittsburgh 19, Pennsylvania.

MARGIN THINNING AND WEB THINNING—You'll increase drill life and reduce heat by thinning the margins along the edges of the drill flutes. As the drill is ground back, the web must be thinned at the point.

DRILL ANGLES—In deep-hole drilling with a single drill, the included angle should be larger than the standard 118° to produce a narrower chip that readily passes up the flutes. When several drills are used, each succeeding drill should have a larger included angle. The new drill then centers on the periphery.



BACK OUTS AND MULTIPLE DRILLS—Prevent chips from jamming in the flutes by drilling to the recommended depth on each pass and then backing out the drill completely, or indexing to the next drill.

GOOD MACHINING PRACTICES SAVE METAL

ALCOA FIRST IN ALUMINUM

INGOT • SHEET & PLATE • SHAPES, ROLLED & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAND, DIE & PERMANENT MOLD CASTINGS • FORGINGS • IMPACT EXTRUSIONS
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS

Finish CYLINDERS *Fast*

— AT LOW COST —

WITH CONTROLLED ACCURACY and QUALITY

ON

BARNESDRIL

HONING MACHINES

58 SECONDS PER BLOCK, SIZE 3-1/2" DIA. x 6-1/4" LONG, .005" STOCK REMOVAL

The manufacturer of these twin cylinder engine blocks requires volume production at low cost to maintain a competitive position. The degree of accuracy and surface finish produced determine the product reputation for service and dependability.

Use of a **BARNESDRIL** 307 Honing machine with automatic cycle control produces cylinders uniformly with extreme accuracy for roundness and straightness, and controls finish at the rate of one block every 58 seconds.

Product reputation is maintained and improved with size accuracy and the proper finish for the best lubricating conditions.

Ask a **BARNESDRIL** Field Engineer to call and demonstrate cost and production advantages of the Honing Process on your work.

Send Send for complete data on Honing and its application. Write for Bulletin B1214.

BARNES DRILL CO.

800 CHESTNUT STREET ROCKFORD, ILLINOIS U.S.A.

. . . a type for every duty, protection against all exposures

FROM the complete Gulf line of quality rust preventives, you can select the proper coatings to fit the desired methods of application, types of metal, length of time for which protection is required, conditions of storage or shipment, and ease of removal.

Gulf makes available both oil- and petrolatum-type rust preventives for both interior and exterior use—including the well known Gulf No-Rust C (polar type) which displaces residual moisture on metal surfaces and lays down a protective coating; and Gulf No-Rust Engine Oils, which prevent corrosion caused by products of combustion left in internal combustion engines.

A Gulf Lubrication Engineer will be glad to co-operate with you in the solution of your corrosion problems. Write, wire, or phone your nearest Gulf office today.

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3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your pamphlet "Gulf Rust Preventives."

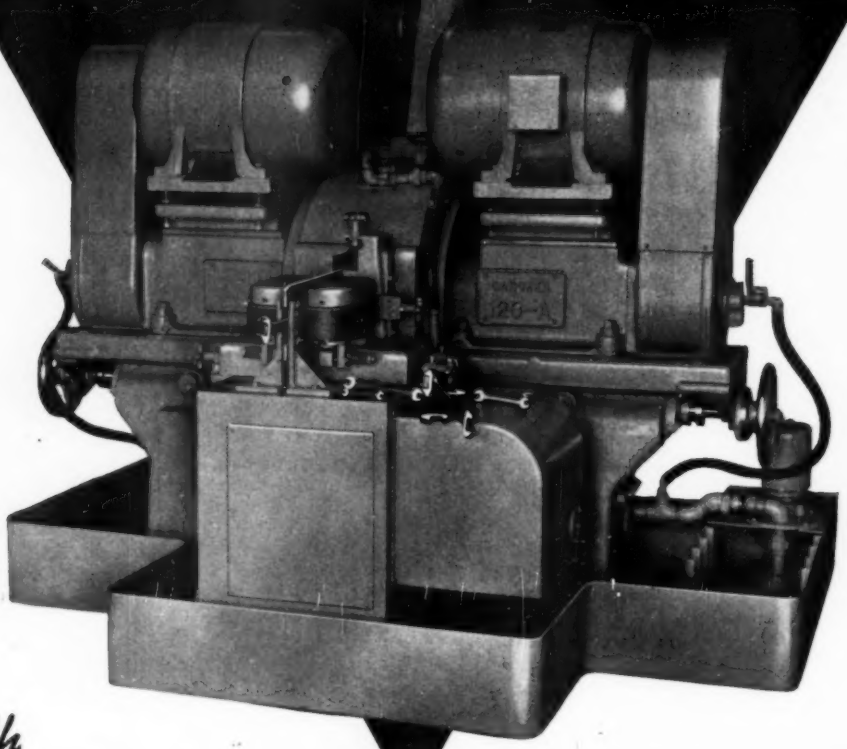
Name.....

Company.....

Title.....

Address.....

CUT your COSTS



with

GARDNER *Double* GRINDING

WHEN competition forces you to "sharpen your pencil", GARDNER *Double* GRINDING will help you cut parallel-surfacing costs to the bone — and without sacrificing quality.

By precision-grinding TWO sides with ONE pass, GARDNER *Double* GRINDERS reduce the time *and labor* required to parallel-surface many parts.

Typical, are these open-end wrenches fed into a No. 120A-23" GARDNER GRINDER in a continuous stream by a feed-thru fixture.

Let our engineers show you how GARDNER *Double* GRINDING will help you meet this buyers market, by cutting down your parallel-surfacing costs.

WORK DATA

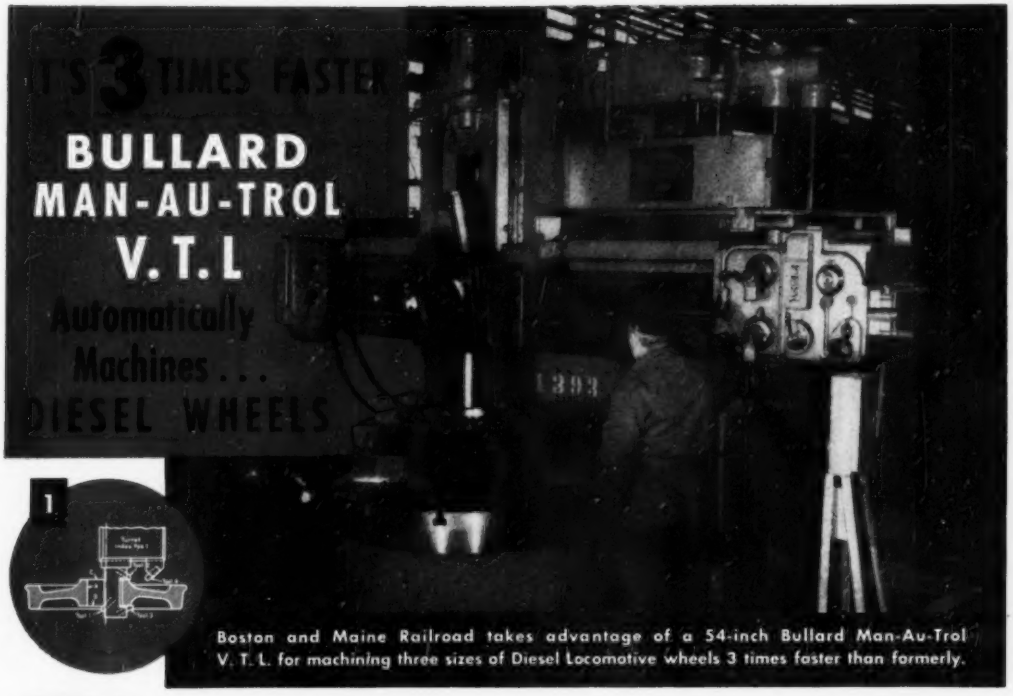
Part: Open End Wrenches
Material: Steel Forgings
Operation: Grind Two Sides of Both Ends
Tolerances: .001" to .002" for Parallelism; .003 for Uniformity
Stock Removal: .030" Maximum Overall
Production: 25 to 30 Per Minute, Per Cut on 6" size
Feed: Hand Load to Feed Belts; Gravity Unload
Machine: #120A-23" Gardner Grinder

GARDNER-GRIND YOUR *Flat* SURFACES

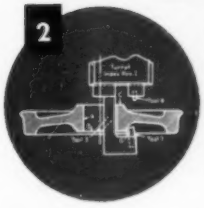
Write for GARDNER *Double* GRINDING Bulletin!

GARDNER MACHINE COMPANY

410 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.



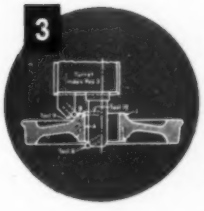
Boston and Maine Railroad takes advantage of a 54-inch Bullard Man-Au-Trol V. T. L. for machining three sizes of Diesel Locomotive wheels 3 times faster than formerly.



Proper tooling, proper sequence and automatic timing of operations, maintains accuracy and saves much time.

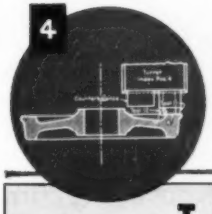
Turret Face #1

Rough bore — straddleface hub — rough form upper radius.



Turret Face #2

Semi-finish bore — finish face upper hub face — rough form lower radius — generate 20 degree angle — finish form lower radius — generate 45 degree angle and finish face underside of hub.



Turret Face #3

Finish bore and chamfer — finish form upper radius — finish hub diameter.

Turret Face #4

Face rim — cut wear groove.

In addition to this method, ask for information on the 54-inch 3 Head Bullard Man-Au-Trol Car Wheel Machine.

There is a Bullard machine for nearly any railroad vertical boring, turning and facing job as well as the regular horizontal boring, drilling and milling jobs.

Write for information relative to your specific work.

BULLARD

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

NEW HELPFUL GUIDE

to gas regulating problems

This new Airco Regulator catalog gives authentic, understandable information on the function and operating characteristics of regulators for the following types of service –

- for welding, cutting, heating, hardening and inert shielded arc welding.
- on cylinders, manifolds and pipe lines.
- for all types of compressed gases – oxygen, acetylene, nitrogen, hydrogen, helium, argon and other industrial gases.
- for use in the laboratory.
- dual stage regulation . . . single stage regulation – and a quick "reason why" one or the other type would give you desired uniform pressures, at less cost, for a particular job.

Everyone concerned with regulating gases under pressure will find use for this helpful catalog. It will save him time, effort and needless waste of money. It contains data regarding the proper regulator for any given type of job.

Send for this valuable, informative guide today! Fill in the coupon below.

Air Reduction
60 East 42nd Street
New York 17, N. Y.

Please send me a copy of your NEW helpful guide to gas regulating problems – Catalog No. 5.

Name_____

Firm_____

Address_____

City_____ State_____

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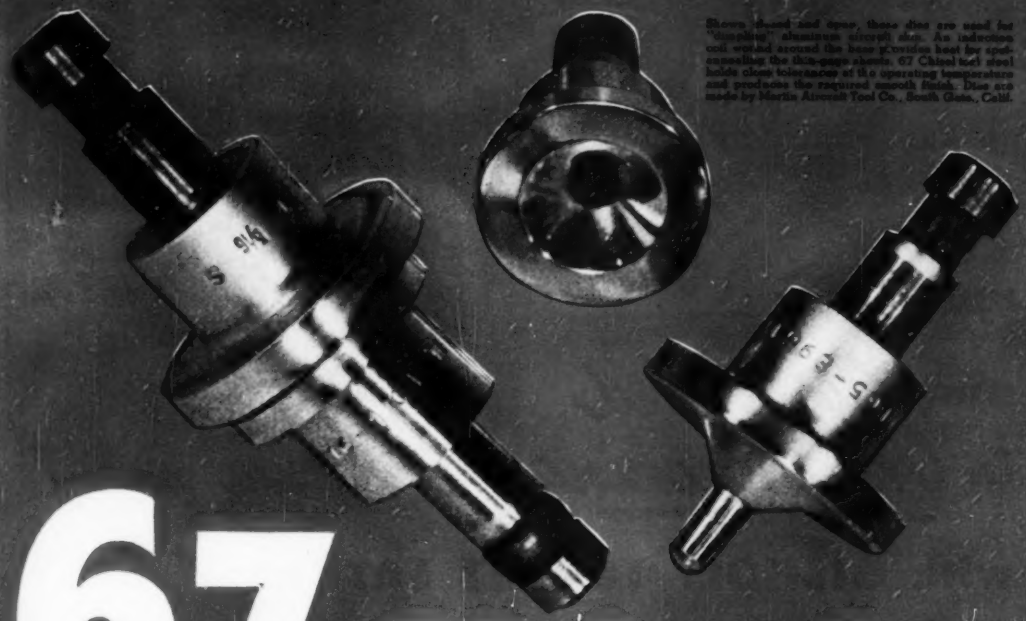
Offices in Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Calcium Carbide . . . Gas Cutting Machines Gas Welding and Cutting Apparatus, and Supplies . . . Arc Welders, Electrodes and Accessories

FOR AIRCRAFT DIMPLING DIES



Shown closed and open, these dies are used for "dimpling" aluminum aircraft skin. An induction coil wound around the base provides heat for spot-annealing the thin-gage sheets. 67 Chisel tool steel holds close tolerances at the operating temperature and produces the required smooth finish. Dies are made by Martin Aircraft Tool Co., South Gate, Calif.

67 chisel

withstands shock, wear and heat

These small, two-piece dies sink thousands of "dimples" in the aluminum skin of aircraft sections. They make conical depressions so that rivet heads can be driven in flush with the surface to provide maximum streamlining. Operated at a temperature of 600 F, the dies also do a spot-annealing job, relieving the local stresses set up in the thin aluminum-alloy sheets during the dimpling operation.

Bethlehem 67 Chisel is used for this job because this chrome-tungsten tool steel has high shock-resistance . . . it resists wear . . . it has good red-hardness . . . it is easy to machine and heat-treat.

67 Chisel is a versatile tool steel. It's suitable for such hot-work tools as headers, piercers, drop-forge die inserts and forming equipment where operating temperatures are below 1050 F. It is also excellent for cold-work tools like chipping chisels, swaging dies, battering tools, shear blades, punches and forming dies. Carburized for extra wear-resistance, 67 Chisel is the first choice for master hobs used in cold-hobbing cavity molds.

Hardened at 1750 F and oil quenched, it has a Charpy impact value of 180 ft-lb and a Rockwell-C hardness of 56.5 after tempering at 400 F.

Typical Analysis:

C	Si	Cr	W	V
0.50	0.75	1.15	2.50	0.20

67 Chisel is available in many sizes and sections in our mill depot . . . and it's also kept in stock by many of our distributors. Get complete information from the nearest Bethlehem sales office or tool steel distributor. Better still, order a test bar and see for yourself how tough 67 Chisel really is!

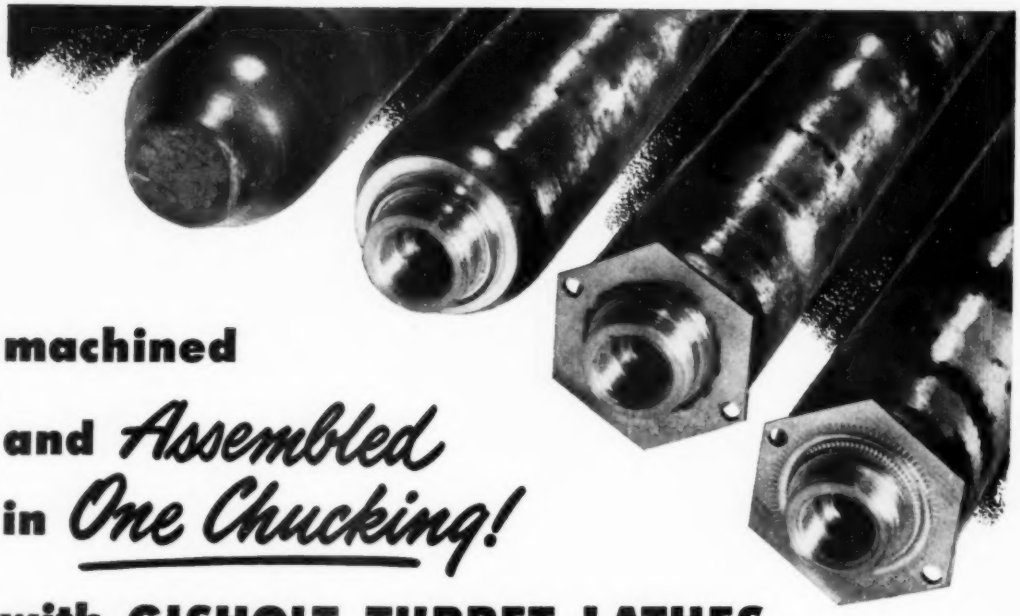
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

67 Chisel . . . one of Bethlehem's Fine Tool Steels



machined and *Assembled* in *One Chucking!* with GISHOLT TURRET LATHES

Talk about clever ideas! Here's one used by the Ansul Chemical Company, manufacturer of dry chemical fire extinguishers, to cut time, cut costs and do a better job.

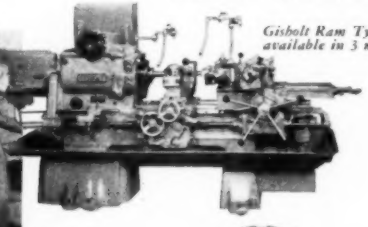
Eight different operations on these gas pressure cartridges are performed on a Gisholt No. 5 Ram Type Turret Lathe as follows: Turn, face, bore, thread, tap, attach splined collar, groove collar, and roll edge. And all in one chucking!

Combining all these operations on a Gisholt Turret Lathe eliminates another handling and welding operation—saves from 30% to 40% of former time. What's more, it has resulted in more uniform work and better appearance.

It's another example of using ingenuity to save money. Gisholt engineers are ready to give you the best of their experience—to help cut *your* time and costs. Write us.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

While part is still turning, splined collar is placed over neck of cartridge. Collar is then grooved and rolled to insure a snug fit that prevents turning or loosening.



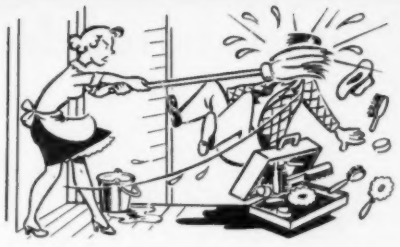
Gisholt Ram Type Turret Lathes are available in 3 models with standard chuck sizes ranging from 8" to 15".

The Gisholt Round Table *represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

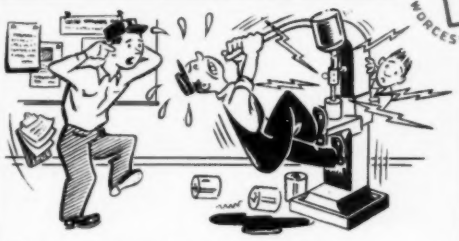
TAPPING TECHNIQUES

Salesman Brutus, when he "taps" on the door,
Shakes the foundations as he knocks with a roar.



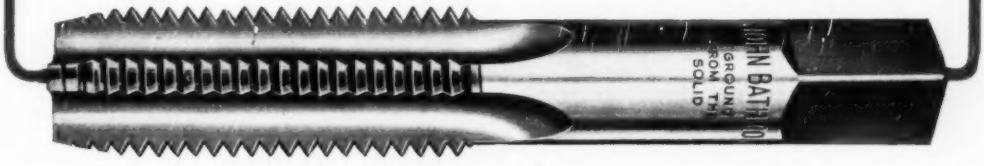
Brute force has no place in our way of life.
In house to house selling, it irks the housewife.

JOHN BATH CO. INC. WORCESTER MASS.



When starting a tap, keep FORCE in control
Or you'll ruin your work with a bell-mouth hole.

For work that's admired, all men are agreed
Bath taps need no force—they'll find their own lead!



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

Bath ground thread taps are made from the highest quality steel. Ground from the solid after hardening, these modern cutting tools are of uniform structure and consistent accuracy.

The uniform hardness of the cutting edge of Bath taps increases tap life and lengthens tap service between grinds.

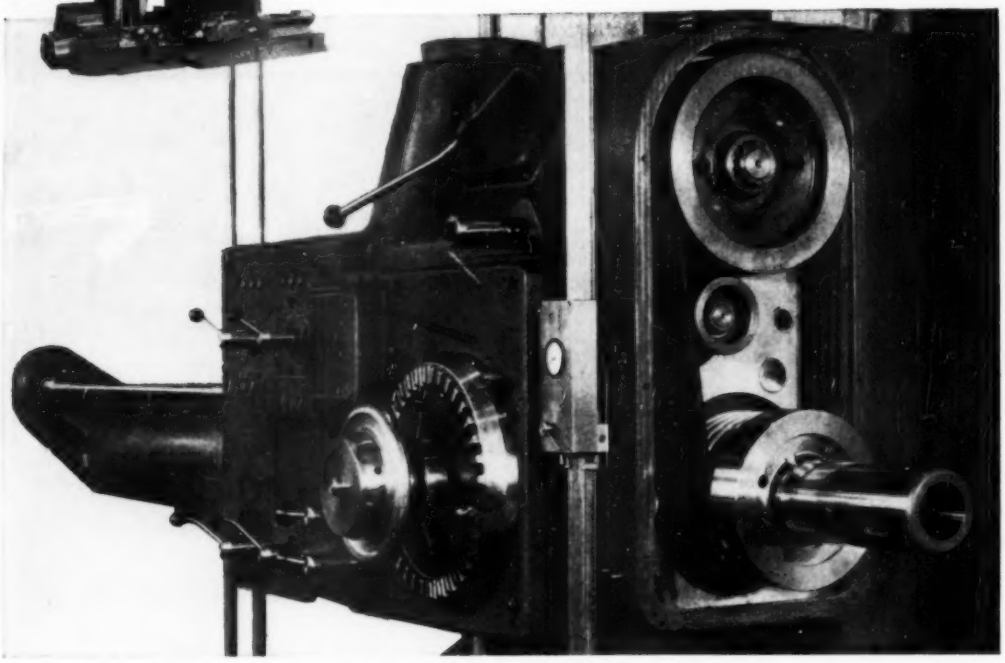
Bath taps are made in many styles for threading all kinds of materials. Available in standard stock sizes or custom built for special jobs. Let Bath representatives help with your unusual threading problems...or write us direct!

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

▸Time-saving single spindle
▸Vibration-free drive at high speeds

. . ONLY LUCAS HAS IT



SINGLE SPINDLE—Lucas Precision horizontal boring, drilling and milling machines incorporate three speed ranges to a single spindle. The low range is through a gear of larger diameter than the largest milling cutter normally used on this machine. The intermediate range is also gear driven, while the high speed range drives through multiple V-belts directly to the spindle sleeve.

VIBRATION-FREE DRIVE—In the high speed drive through the multiple V-belts, the integral low and intermediate heavy rim gears mounted on the spindle sleeve are out of mesh and act as a flywheel to produce a vibration-free drive for carbide tools.

The operator can change from one speed to another by a convenient lever mounted on the spindle head. With the full speed range available on the single spindle, the operator can perform operations of drilling and boring at proper speed with one setting of the spindle head.

Wherever they are in service, Lucas Precision horizontal boring, drilling and milling machines accomplish basic savings in tools and time. Their versatility is so great that they are kept in practically constant use.

Built in 3", 4", 5" and 6" spindle models, all available with Automatic Power Positioning which eliminates jigs and fixtures and makes the horizontal boring machine a highly accurate production machine. Work ranges from 36" x 36" to 96" x 120". All sizes furnished with either two-way or four-way beds. Write for descriptive literature.

LUCAS OF CLEVELAND

LUCAS

Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

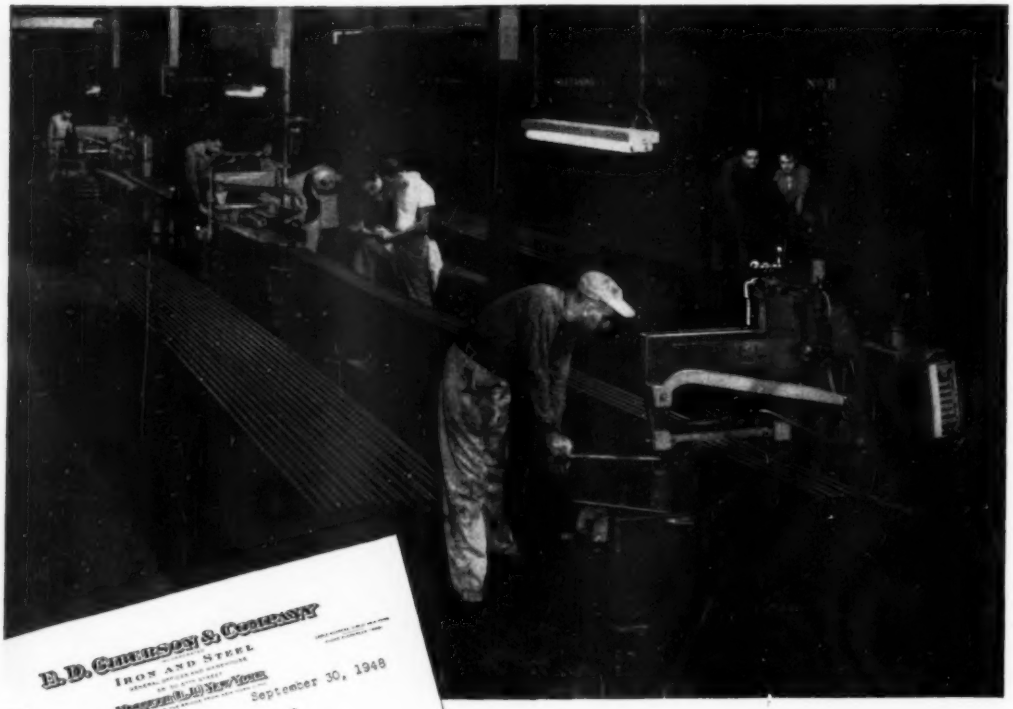
Steel-Weld FABRICATION

This rotating base for a locomotive crane, which was redesigned by Mahon for Steel-Weld Fabrication, is typical of thousands of Steel-Weld fabricated parts and assemblies produced by Mahon for hundreds of manufacturers throughout the country. Mahon design engineers are available to assist you in initial design or redesign for Steel-Weld Fabrication. This service, backed by craftsmen highly skilled in the welding art, and complete facilities for rough or finished machining — regardless of size or weight — assures you a better, smoother appearing job, embodying every advantage of Steel Weld Fabrication.

THE R. C. MAHON COMPANY
DETROIT 11, MICHIGAN

Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON



E. D. GIBERSON & COMPANY
IRON AND STEEL

September 30, 1948

Armstrong-Blum Manufacturing Co.,
Chicago, Illinois

Gentlemen:

For almost half a century as direct distributors of Boiler Tubes, Condenser Tubes in seamless steel, electric welded steel and stainless steel, as well as seamless and welded Mechanical Steel Tubing, Seamless Steel Pipe, Stainless Steel Pipe and Tubing, we have cut in our warehouse many million feet of Tubular Steel Products.

The nature of our business necessitates both speed and accuracy in multiple cutting to exact lengths required by customers. When we decided recently to install three more 9A MARVEL Heavy Duty Automatic Hack Saw Machines, it was with full knowledge of their efficiency.

We can assure you of our entire satisfaction with their operation and regard them as valuable additions to our equipment.

Yours very truly,
E. D. GIBERSON & COMPANY, INC.
E. D. Giberson
President

Another Tubing Warehouse

"Goes MARVEL"

Warehouses that are not equipped with proper sawing machines find that the cutting of steel tubing (especially the stainless types) is a difficult and costly job. But E. D. Giberson & Company, New York, have cut off millions of feet of all types and sizes of steel tubing to accurate lengths, economically and without difficulty, due to the fact that they have long been properly equipped with MARVEL SAWS. And because they have found MARVEL SAWS so trouble-free, so reliable, so economical to operate and so universally suited to all their cutting-off jobs, they have recently added this row of three new MARVEL No. 9A Automatic Hack Saws. With this additional equipment, they have expanded their facilities and can more promptly serve their fast-growing list of satisfied customers with steel tubing of all types and sizes, "cut to customer's specified lengths."

The local MARVEL Field Engineer will be glad to study your range of cutting-off work—whether it be in pipe, structural shapes, bars, or the toughest and largest alloy billets—and will then make recommendations on how you can improve your cutting-off operations to reduce costs and increase man-hour output.

Just write us on your letterhead: "Without cost or obligation on our part, send your local Field Engineer to look over our cutting-off operations."

See our CATALOG in

Metal Cutting
MARVEL SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. COMPANY

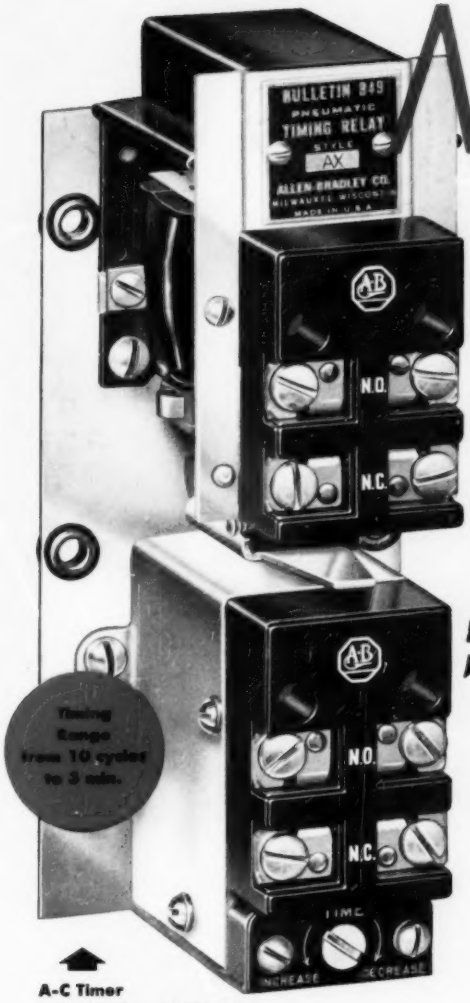
5700 WEST BLOOMINGDALE AVENUE **"The Hack Saw People"** **CHICAGO 30, ILLINOIS**

NEW...

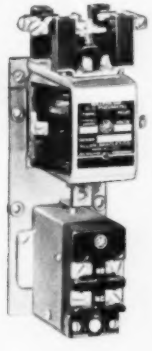
Bulletin 849

PNEUMATIC TIMING RELAY

Good for Millions of Operations



A-C Timer with Auxiliary Contacts



D-C Timer

- FOR "DASH UP" OR "DASH DOWN" OPERATION
- AVAILABLE FOR NEMA TYPE 1, 4, 7, and 9 APPLICATIONS

This new, compact, solenoid type, pneumatic timing relay utilizes a synthetic rubber bellows for controlling the tripping time. Has a range of from 10 cycles to 3 minutes, and an accuracy of approximately ±10%. Its setting is easily adjustable over a wide range, and the relay resets instantaneously. This timer will provide satisfactory operation irrespective of temperature, humidity, or vibration conditions. Available with quick make and quick break, double pole, silver alloy main contacts—one set normally open and one set normally closed. Terminals are readily accessible from the front. A duplicate set of contacts for pilot control can also be provided, actuated directly from the solenoid. The unit can be readily changed from "dash up" to "dash down" operation by simply inverting the solenoid. Write for information on this new Bulletin 849 Pneumatic Timing Relay.

ALLEN-BRADLEY CO.
1316 S. Second St., Milwaukee 4, Wis.

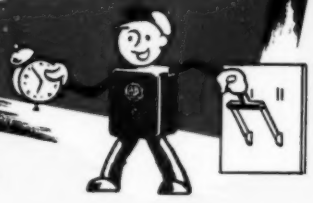
ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

OTHER RELIABLE TIMING RELAYS

TO FIT YOUR REQUIREMENTS

A-B Quality

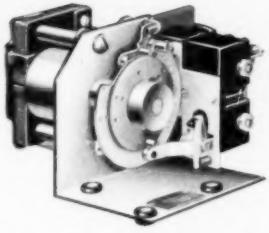


BULLETIN 850
MOTOR DRIVEN TIMING RELAY

Designed for timing comparatively long intervals with a high degree of accuracy where high speed recycling is not required. Furnished in several ranges with a maximum time delay of from 1 to 15 minutes. Variations in time between successive operations are less than 1% of the full scale range. Its synchronous motor is suitable for a-c pilot control service only. Has a single pole switch for normally open or normally closed operations.

BULLETIN 850
TYPE L LAUNDRY TIMER

Similar in design to the Bulletin 850 Motor Driven Timing Relay, this timer is specially designed for controlling washing machines and other equipment where the motor is run for a given period in one direction, reversed, and then run in the opposite direction.



BULLETIN 852
ELECTRONIC TIMING RELAY

Designed primarily for exact timing in frequent operation. It has a range of 20 to 1 and is provided in eight timing ranges with from ½ second up to 2 minutes maximum time delay. The reset time is approximately one-tenth of the maximum time delay. This is a flexible timer that can be recycled rapidly over long periods. Furnished with two normally open, two normally closed, or one normally open and one normally closed contacts.

BULLETIN 848
FLUID DASHPOT TIMING RELAY

Here is a magnetic type timing relay that combines simplicity, dependability, and low cost. It can be used in many applications where reliability is more important than exactness of timing. Operates at ambient temperatures from +120 F to −30 F without undue variations in timing. Has an adjustable range from 2 to 20 seconds and is available for a.c. or d.c. . . . in single pole construction . . . with either normally open or normally closed contacts.

ALLEN-BRADLEY

MOTOR CONTROL

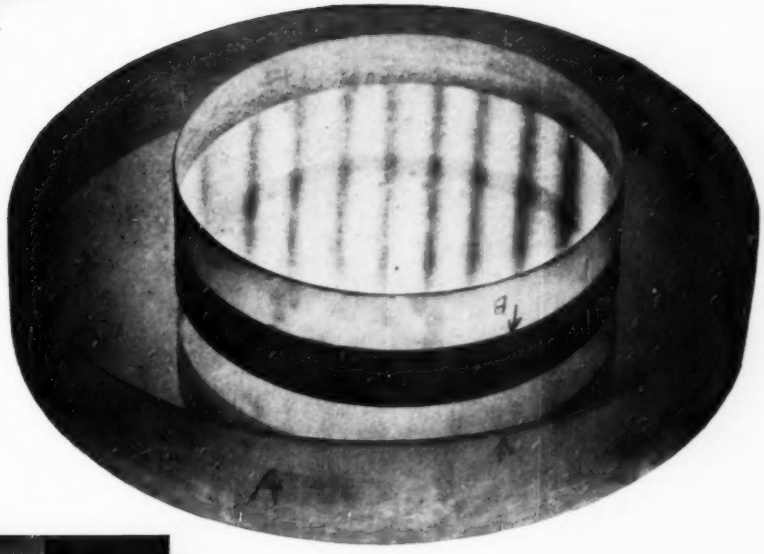
A-B Quality

Write for New Timer Bulletin

Allen-Bradley Co.,
1316 S. Second St.,
Milwaukee 4, Wis.

Van Keuren OPTICAL FLATS
are the proof of Precision

BOSTON ◉——



——◉ NEW YORK

Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

CATALOG AND HANDBOOK NO. 34

THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

NIAGARA

PRESENTS A COMPLETE *new* LINE OF ULTRA-MODERN FOOT SHEARS

with A SIZE TO FIT YOUR REQUIREMENTS

30 inch through 6 foot—16 gauge
8 and 10 foot—18 gauge

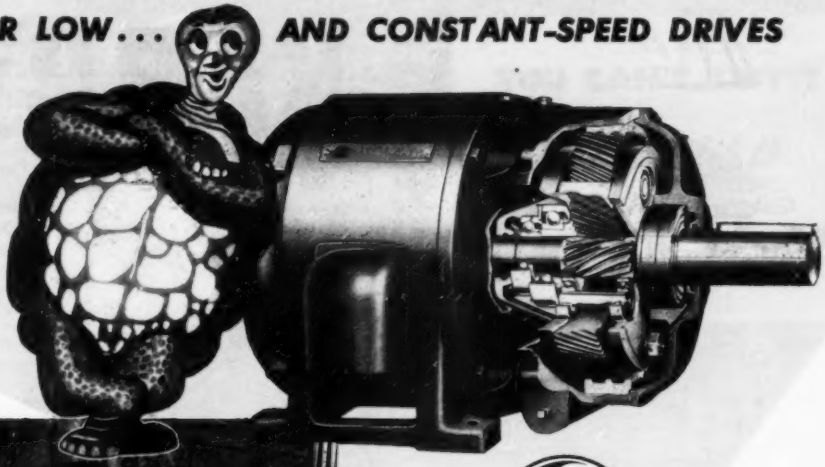
● Pick your foot shear from this complete new Niagara line. Check all their advanced and exclusive engineering features. Distinctive Styling. Easy, Lively Operation. Accurate Cutting. Clear Visibility of Cutting Line. Unbreakable Steel Construction. Strength and Stiffness. Light Weight. Lifetime Bronze Crosshead Ways and Treadle Bearings. Niagara Alloy Tool Steel Knives. Quick-Acting Back Gauge and Convenient Front and Side Gauges.

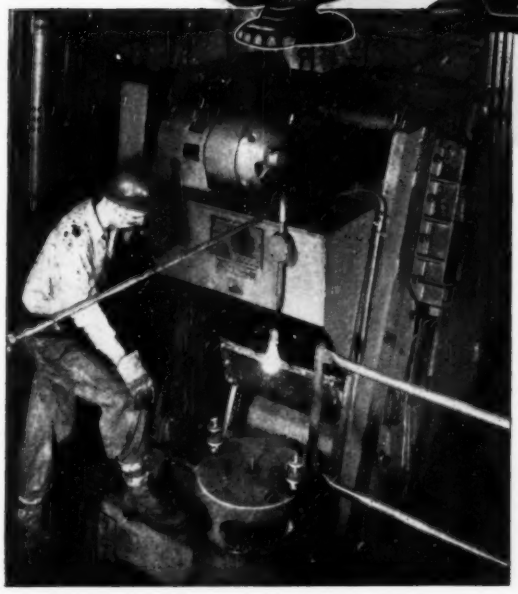
Write for data.

NIAGARA MACHINE & TOOL WORKS · BUFFALO 11, N. Y.
DISTRICT OFFICES: NEW YORK, CLEVELAND, DETROIT

IMMEDIATE DELIVERY

FOR LOW... AND CONSTANT-SPEED DRIVES





Here is a typical gear-motor installation. This secondary refuse elevator in a coal processing plant had to have a low-speed drive that would fit conveniently into a tight spot. A G-E Tri-Clad gear-motor is right there with all the answers on this job. It can do the same kind of a superior job for you.

GEAR-MOTORS

We have the gear-motors you need available in most ratings right off the warehouse shelf. Standard units are now available on normal shipments of one to three weeks.

General Electric's planetary gear system gives an additional 1:1 ratio of reduction. This type of transmission prevents slippage and minimizes mechanical power losses.

When you buy a General Electric Tri-Clad gear-motor you are buying:

- **Extra load-carrying capacity in a smaller space**
- **Easier mounting in a smaller space**
- **Industry proved Tri-Clad construction**
- **Higher operating efficiency because of low power losses**
- **Reduced maintenance costs**
- **Safe operation**

For the majority of your low-speed drives, standard G-E gear-motors fill the bill. Our engineers can meet special requirements by designing to your specifications.

To fill your needs on all gear-motor requirements, call your nearest General Electric Sales Office or your local distributor. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

HYSTER KARRY KRANE®

THE **REACH** OF A GIRAFFE

THE **STRENGTH** OF AN ELEPHANT

THE **ENDURANCE** OF A CAMEL

- ✓ Lowest priced 10,000-lb. capacity mobile crane.
- ✓ Pneumatic tires—works anywhere indoors or outdoors.
- ✓ Adjustable boom—5 positions.
- ✓ Trunnion steering for maximum maneuverability.
- ✓ Speeds up to 10 m.p.h. in either direction.
- ✓ Great for loading and unloading gondolas, flat cars, motor vans.

TRY IT... YOU'LL BUY IT...

Once a Karry Krane is in your plant or storage yard—EARNING for you—CUTTING COSTS for you—LIFTING AND MOVING all kinds of materials—you will wonder how the work was ever done BEFORE.

THOUSANDS OF KARRY KRANES ARE WORKING FOR HUNDREDS OF INDUSTRIES.

In some businesses it's a *production* mobile crane with regular materials handling jobs to do on schedule every day.

In other businesses, it's a utility, all-purpose, standby machine—able to go anywhere—ready to do any emergency or unusual moving job. Like good insurance—it's ready when you need it.

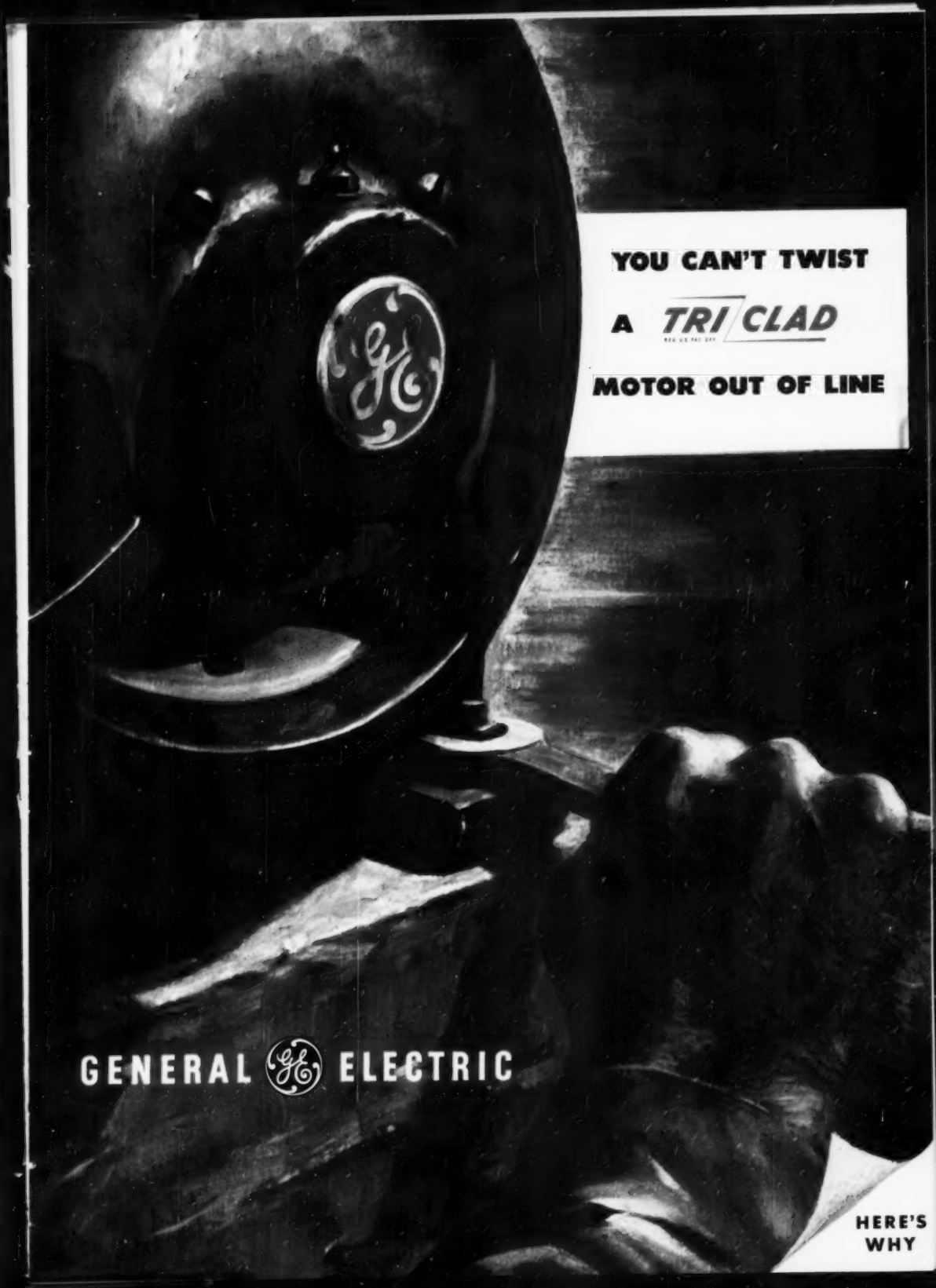
The Karry Krane is the LOWEST PRICED, 10,000-pound capacity mobile crane. It can do anything (within its capacity) that ANY OVERHEAD OR STATIONARY CRANE OR HOIST CAN DO and it can go anywhere to do it.

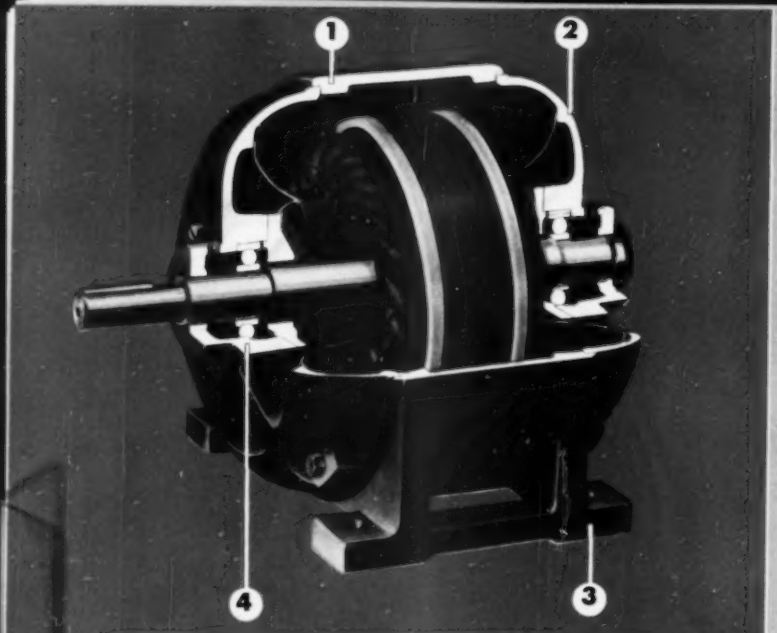
TRY IT and YOU'LL BUY IT. A demonstration in your plant—on your home grounds—will prove it to you. Your Hyster distributor is anxious to help you.

HYSTER COMPANY

THREE FACTORIES

2902-14 N. E. Clackamas, Portland 8, Oregon
1802-14 North Adams St. . . . Peoria 1, Illinois
1010-14 Meyers Street . . . . . Danville, Illinois


YOU CAN'T TWIST
A TRI CLAD
MOTOR OUT OF LINE
GENERAL ELECTRIC
HERE'S
WHY



Look at the solidity of a Tri-Clad's thick-section cast-iron frame (1) and heavily reinforced end shields (2) . . . its heavy integrally cast feet (3). Do you wonder we say "Tri-Clad gives you structural strength and rigidity no other general purpose motor can match"? Notice, too, the *completely enclosed* bearings (4). A Tri-Clad motor will run safely without relubrication for years — as long as any general-purpose motor you can buy. Yet it's grease-gun easy to lubricate if you ever need to.

You can't twist a TRI CLAD motor out of line

Try as a heavy-muscled mechanic may, he can't twist a Tri-Clad motor frame when bolting it to an uneven surface. The bolt will snap before he can pull that rigid cast-iron structure out of line.

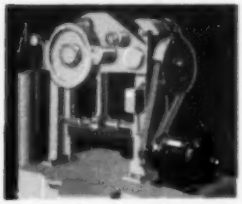
Important? It's one of the basic reasons General Electric believes cast iron to be the ideal structure for general-purpose industrial motors. Other reasons? Cast iron has unusually high resistance to rust and corrosion. It has an inherent damping action that minimizes resonance. And . . . it won't take on an injurious permanent "set" as a result of accidental blows or mechanical abuse.

Want a motor that's been **SERVICE-PROVED** in 5 billion hours of rugged industrial use? Nearly all types and ratings are **AVAILABLE FROM STOCK.**

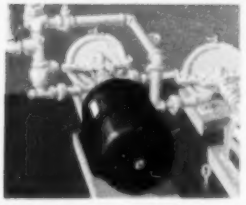
Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

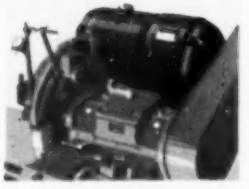
YOU CAN'T BEAT TRI CLAD EXTRA PROTECTION



G-E open (drippproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.

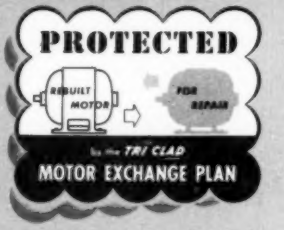


G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.



G-E Type ACA induction motors for adjustable speeds—provide 3 to 1 speed range. From 3 to 75 hp.

G-E flange and face-type motors for use where the machine supports the motor, or vice versa. From 1/20 to 60 hp.



Look for this **EXTRA** on the motor you buy!

Variable Idle Time Control
Gear Box Transmission Support
Idle Time Movement Brake Adjustment
Headstock Transmission Support
Endworking Attachment Spindle Mounting
Support by Work Spindle Carrier
Tool Holder Anchorage
Approved Types of Clutc
Job Changeover Facility
Power Reverse Drive Support to All
Machine Builder's Block and Line Test
Material and Fi
Proximity of Front Bearing to Spindle
Support by Work Sp
Support by Main End Slide
Support by Work Spindle Carrier Indexing
Length of Standard Main End Slide
Top Member Support to All Headstock and Gear Box Members
Maximum Machine Main End Slide Load Recommended
Support by Main Cross Slides
Form Tool Holder Interchange
Location of Tooling Stations in Respect to Chip Clearance and Size Control
Gear Material, Size and Finish
Main Cross Slide
Main Cross Slide Po
Stops
Main End Slide Replacement
Camshaft Replacem
Facility
Minimum Overhang

BUYER'S
COMPARISON CHART
FOR
MULTIPLE SPINDLE AUTOMATIC
BAR MACHINES

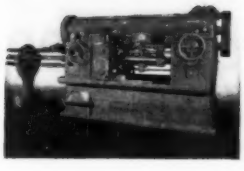
THAT'S WHY BUYERS ARE BORN

Buyers are indispensable in the evaluation of machine facility to meet particular requirements. If all machines were perfect there would be less need of Buyers. Perfect machines would meet all requirements.

But there are no perfect machines, and requirements vary with the many conditions at individual plants. The selection of a machine does not necessarily mean that it unqualifiedly fills all requirements. It may, in comparison with other machines, come closer to filling them.

In comparing one machine with others of the same type, an analysis chart can be very helpful. The subject should be thoroughly covered, and equal opportunity should be available to all machines compared.

CONE has made available an analysis chart for the horizontal type, multiple spindle, automatic bar machine. You will find it interesting and different. Write for free copy. There is no obligation.



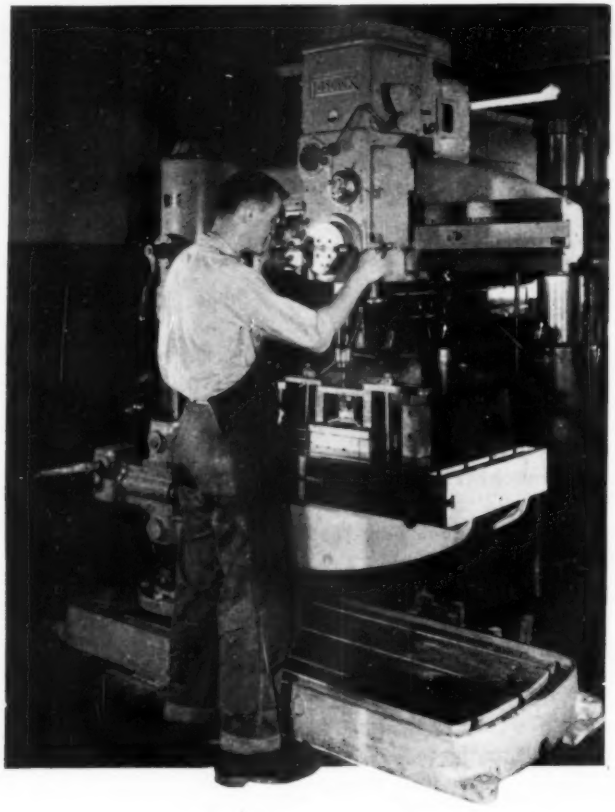
A comparison with ALL Automatics will lead you to

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Wherever there are small jobs requiring holes up to 1½" diameter *You'll Find*

FOSDICK Sensitive RADIAL



Shown is one of the hundreds of Fosdick Sensitive Radials in action in shops throughout the nation.

The adaptability of the Fosdick Sensitive RADIAL in handling high speed sensitive drilling, reaming and tapping operations on a wide range of small jobs has made its use practical in both large and small machine shops.

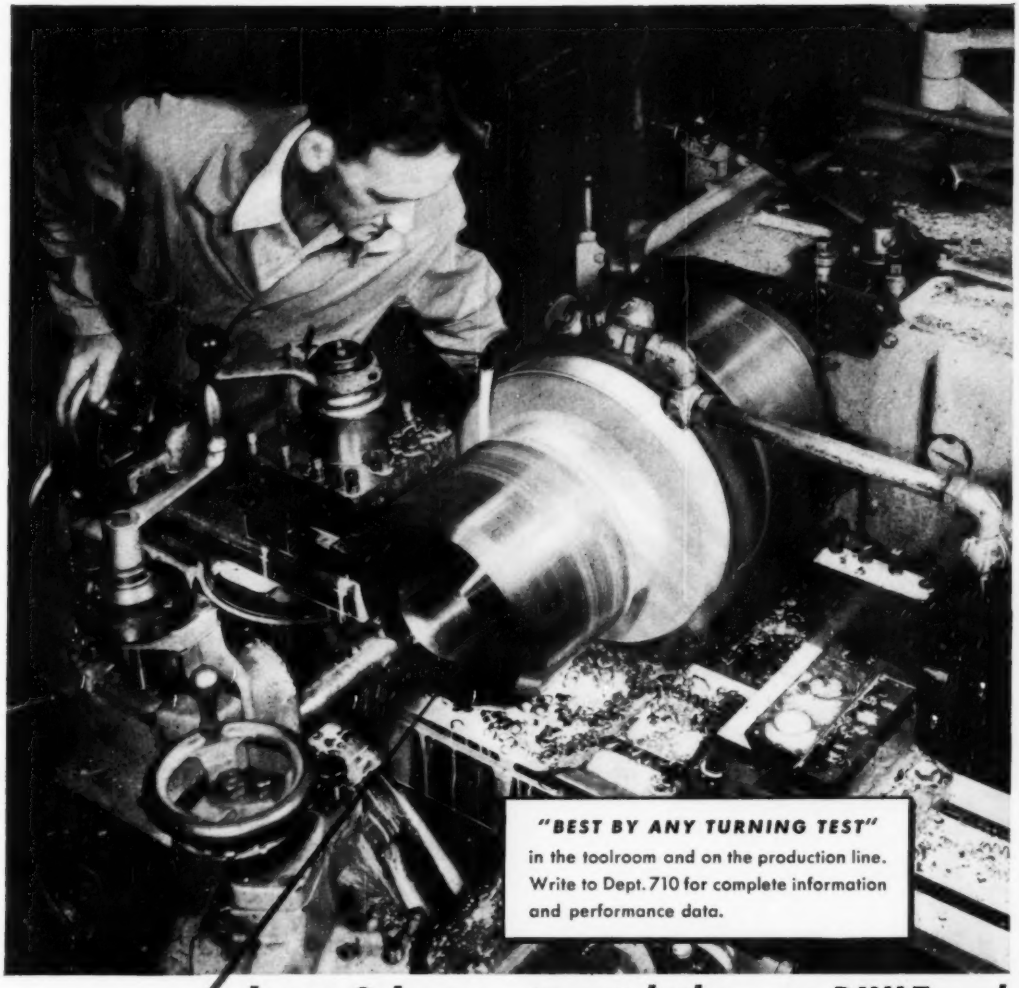
For example, the sturdy base construction—the one-piece column—the heavy arm at fixed height provide the rigidity essential to maintain required tolerances. The adjustable table assures correct position of work for all jobs.

Controls are all conveniently located on the head making movement of the head—feed and speed changes exceptionally easy for the operator.

A recent improvement is the patented lighting feature exclusive to Fosdick Radial Drills. On this machine a 36" long fluorescent tube is mounted on the back of the arm in such a position as to eliminate glare from operator's eyes, yet provide illumination the entire width and length of the table.

If you are interested in the many economies provided by this Sensitive Radial, write for the new Fosdick Sensitive Radial Bulletin S. R. A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

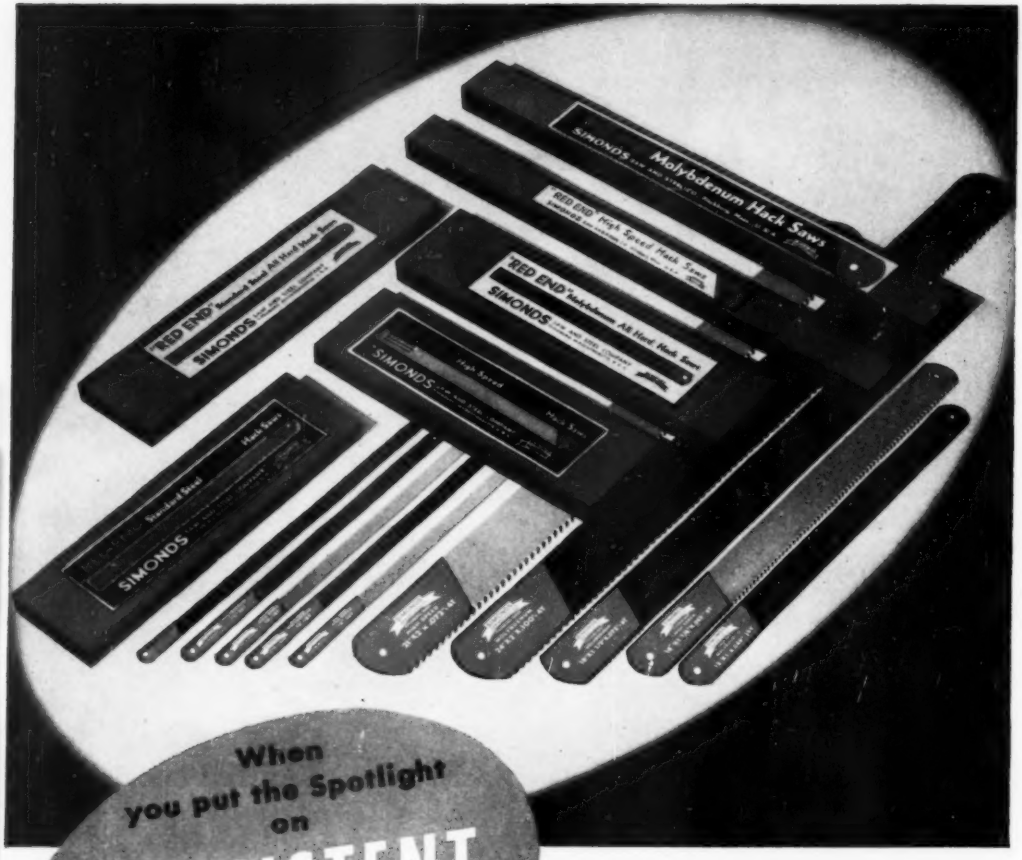

"BEST BY ANY TURNING TEST"
in the toolroom and on the production line.
Write to Dept. 710 for complete information
and performance data.

Jones & Lamson turret lathes are BUILT and

POWERED TO PRODUCE

MORE CHIPS **per tool**
MORE PIECES **per hour**
MORE PROFIT **per job . . . than any turret lathe of comparable size!**

Turret Lathe Division **JONES & LAMSON**
MACHINE COMPANY
Springfield, Vermont, U.S.A.
MACHINE TOOL CRAFTSMEN SINCE 1835



When you put the Spotlight on

CONSISTENT "CUT-ABILITY"

In Hacksaws

You put it squarely on SIMONDS "Red End" Blades

Take a special Simonds steel . . . formulated, poured, and spectrometer-checked in Simonds modern electric mills. Cross-roll that steel 90° for uniform quality. Mill the teeth . . . and set them automatically. Then salt-harden the blades in special Simonds-designed furnaces. *And what have you got?* Exactly what you would expect to have . . . the finest blades made for hand frames or power machines . . . Simonds "Red End" Hacksaw Blades.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

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BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 811 S.W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

"Have you learned this fact?"

"Throw away the book!"
Here are the new Shell soluble oils that can COMPLETELY CHANGE your cutting fluid practice
SHELL METAL WORKING OILS

It may help you slash cutting fluid costs 75 to 90%!

You have experienced the economy of soluble oils on light machining and drilling jobs . . . Haven't you often wished that this same economy could be extended to your tougher jobs, which have always required expensive conventional cutting oils?

Shell has developed *soluble* oils that replace conventional cutting oils on many heavy duty jobs *with emulsions as high as 10 to 1.*

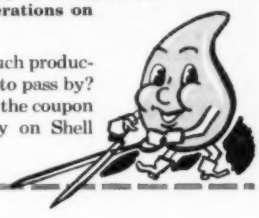
These actual cases prove it:

1. No. 52100 steel, turned, drilled, and milled for ball bearing assemblies . . . formerly required high-cost cutting oil. Now machined just as well using a Shell heavy duty soluble oil mixed with 10 parts of water.

2. In a very heavy turret lathe, turning rock drill bits, the cutting speed was actually increased when a Shell heavy duty soluble oil, diluted 4 to 1, replaced an oil-type cutting fluid.

3. Replacing an expensive, highly compounded cutting oil, an emulsion of one part of a Shell heavy duty soluble oil and 10 parts of water proved highly satisfactory in milling and profiling operations on gun receivers.

Don't you agree that such production savings are too vital to pass by? We suggest that you mail the coupon now for the whole story on Shell heavy duty soluble oils.



Shell Oil Company, Incorporated
54 West 50th Street, New York 20, N. Y.; or
100 Bush Street, San Francisco 6, California

Gentlemen: Please furnish available information on the new heavy duty soluble oils.

Name_____

Company_____

Address_____

SHELL

SHELL METAL WORKING OILS

Get Fast Repair

SAVE TIME, MONEY ON MOTOR, TRANSFORMER & CONTROL SERVICE!

A-2661

EXAMPLE: **Large generator exciter rebuilt in 48 hours — quick service by Consolidated Electric Motor Co., N. Y.**

MACHINE was taken out of service Friday night. Full capacity was needed for Monday morning peak load. Work had to be done quickly and done right. Consolidated worked all week-end and came through on schedule.

That's the kind of service you can get when you need it most from Allis-Chalmers Certified Service Shops in practically every industrial center in the country. Economical for routine service work, too.

Outstanding independent service organizations are selected to be Allis-Chalmers Certified Service Shops. Each meets exacting A-C standards for experience, modern equipment, skilled workmen and reputation for fair dealing. Your nearest A-C Sales Office will give you the name of the Certified Service Shop serving your community.

ALLIS-CHALMERS MOTORS FOR ALL NEEDS—

From ½ to 200 hp — call your nearest A-C Authorized Dealer or Certified Service Shop. Larger sizes to 25,000 hp and up, contact nearest A-C Sales Office.

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

Sold . . .
Applied . . .
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by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

ALLIS-CHALMERS

CORRECT POINT ANGLE

Increases Drill Life Almost 100%

● Even the finest tool—such as the CLE-FORGE High Speed Drill pictured here—will work better and last longer if it is properly used. ◈ Last year an engine manufacturer was getting only fair results on a certain drill press operation. The drills seemed to be wearing out too quickly. He mentioned this to one of our Service Representatives, who studied the problem and recommended changing the type of point on the drill. Result: Tool life increased almost 100%! ◈ When *you* have a problem that involves drills, ask our nearest Stockroom to send a *Cleveland* Service Representative, or . . .

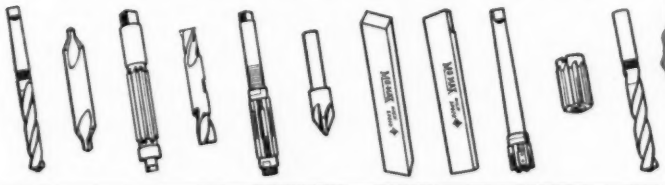
Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

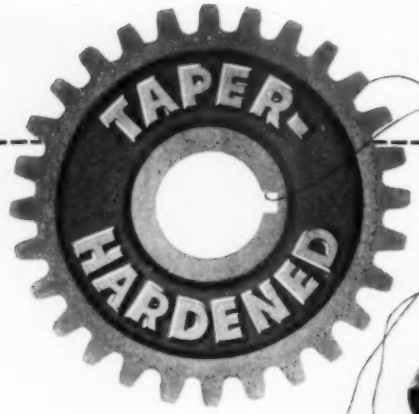
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5
Los Angeles 11 • *E. P. Barrus, Ltd., London W. 3, England*

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS



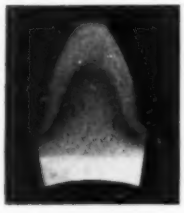
YOU CAN BE **SURE**.. IF IT'S

Westinghouse



Hard and Tough

this "taper-hardened" tooth bends before it breaks



Taper-Hardened Tooth Section

Case-Hardened Tooth Section

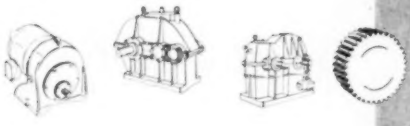
The taper-hardened tooth above bent under the same force that snapped the case-hardened tooth. Yet a test will show wearing surfaces of nearly equal hardness.

The cross sections at the left show why taper-hardened gears have resilience and life under their hard surfaces—why they last longer in punishing service—why they "roll with the punch". Notice the graduated hardness in the taper-hardened tooth—blending down the scale from maximum hardness at the surface to toughness at the ductile core. Compare it with the thin, brittle, shell-like hardness of the case-hardened tooth in which there is no give, no bend.

No wonder "taper-hardened" BP gear steel makes gears last so long.

For complete information on taper-hardening, write for free copy of "BP Gear Steel" B-4395, Westinghouse Electric Corp., Dept. 19, P. O. Box 868, Pittsburgh, Pa.

J-07276



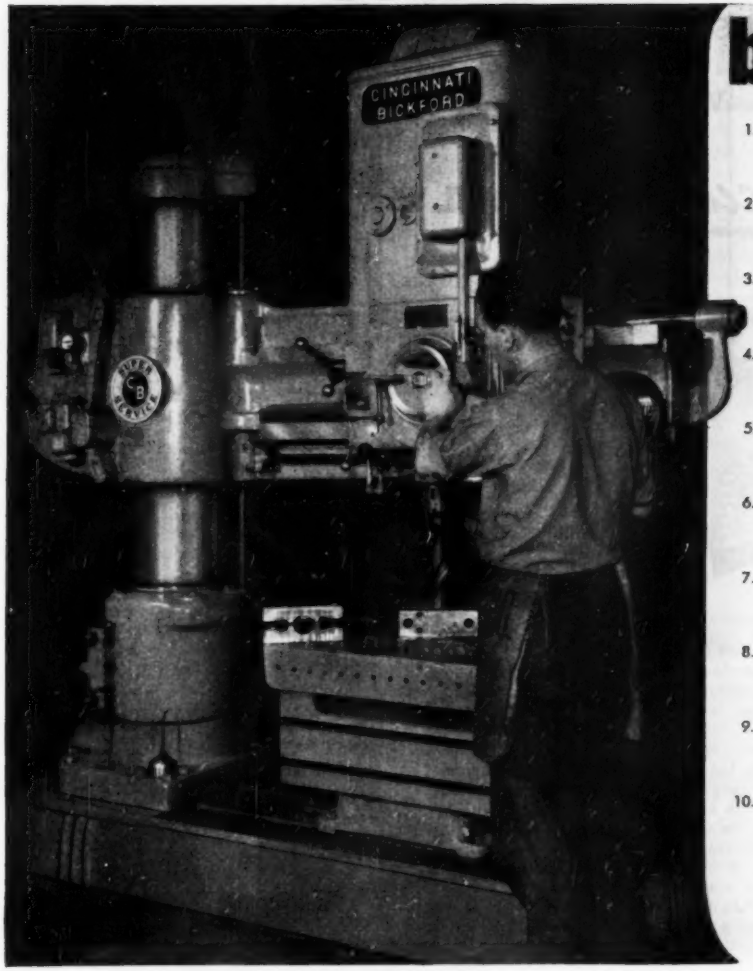
Westinghouse

GEARED DRIVES

MEMBER OF AGMA

WESTINGHOUSE W

2 to 3 times FASTER production



because

1. Controls are all centralized at the head —
2. All 36 speeds and 18 feeds are in the head —
3. Instant spotting with power rapid traverse —
4. Quick acting hydraulic arm and column clamp —
5. Fast elevating and lowering of arm —
6. Large, clear compensating depth gauge —
7. Positive feed clutch controlled with finger tip ease —
8. Drive from motor to spindle is anti friction mounted —
9. Automatic filtered oiling driven by constant speed pump —
10. Selective sliding gears are used throughout —

Job — The Cincinnati Bickford Super Service Radial with 4' arm length 11" diameter column is at the Richmond Manufacturing Company, Lockport, N. Y. — drilling and reaming 2-¼" holes 3" deep. They say, "This machine is very rapid and easy to handle and is two to three times faster than the machine previously used on this job."

Equal Efficiency of Every Unit Makes the Balanced Machine

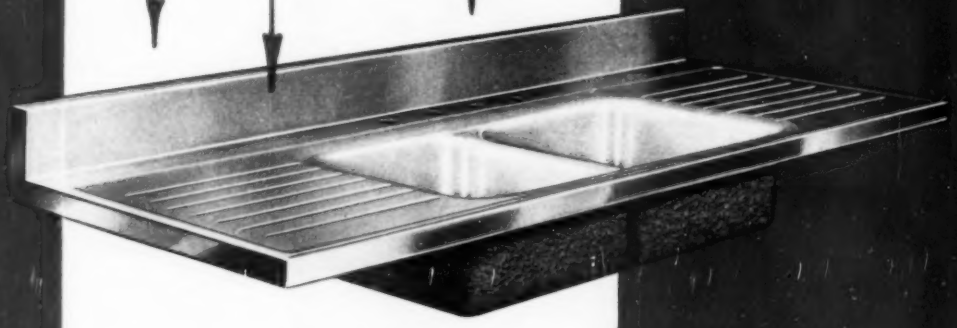
Good judgment in selecting the proper machines, tools, and fixtures will consistently produce the best manufacturing results. Our CUSTOMER PRODUCTION ENGINEERING SERVICE in the metal drilling field represents the collective experience of many years (since 1874). Make your problems ours - - let us show you a profitable Radial or Upright Drill production application. Your most urgent production problems warrant our immediate attention.

THE CINCINNATI BICKFORD TOOL CO. RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½" dia. col., 2½' arm, to 26' dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28"
Jig Borers, Portable Horizontals
Spacing Table Machines

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

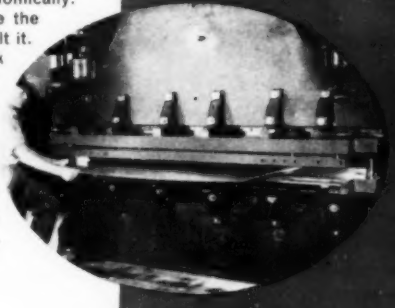
Indenting polished steel sink decks with a *Special* DANLY DIE SET!



A unique die set installation...
enables Geneva Modern Kitchens, Inc., of Geneva, Illinois to minimize changeover time in stamping a wide variety of sink deck sizes.

For a finish forming operation, production men at Geneva Modern Kitchens, Inc. were faced with the problem of indenting a wide range of sink deck sizes economically. A big precision die set, big enough to handle the largest size, was the answer . . . and Danly built it. With 2½" diameter leader pins and a 3¼" thick shoe, this 112" by 25" special Die Set embodies the precision and accuracy standards of the famous standard Danly Precision Die Sets.

And this is only a single example of how Danly's special facilities can help solve the die and stamping problems that arise in your shop. Take advantage of die set designing and manufacturing experience accumulated in more than 25 years of service to the stamping industry . . . bring your special die set problems to Danly.



Send for this free bulletin on Danly's special die set machining service today!

DANLY *PRECISION DIE SETS . . Standard and Special*

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILL.

SPOT NEWS OF METALWORKING

A pressure-casting process which improves strength of aluminum and brass products 10-40% and which reduces porosity to minimum has been announced by Budds Aero Castings, Inc., Canaan, Conn. Dies set in conventional upright hydraulic presses are filled with molten metal and pressure maintained on "shot" until after solidification to refine and "coin" the metal. Automobile makers are considering process to replace permanent molding of transmission parts to cut costs and increase quality.

Surface of 35-lb steel compression mold for television console cabinet is polished with diamond abrasive powder instead of being chrome-plated at plant of midwestern manufacturer. Polishing off 0.003-0.005 in. of skin after hardening exposes a tough, wear-resistant surface. Mold is largest made commercially to date.

German metalworking manufacturers are reluctant to take out patents on new machines and processes because they fear that Allied governments in western Germany will pass along details of these new developments to their own industrialists. Look for a sizable volume of new German machines after the Germans believe that they have adequate legal protection for their inventions.

An upturn in machine tool orders of about 10% took place in August, according to preliminary estimates. Shipments of machine tools last month rose 15% over the July level.

Packard Motor Car, Seegar Refrigerator, Briggs, Philco and Ford had to get court orders to remove their molds from the struck Goodrich plant in Akron, Ohio. Each company had to post $10,000 with the Summit County sheriff before the molds could be taken out.

Postwar trend: a number of shops which have made only tools and dies since 1941 have turned to manufacture of goods fabricated before the war. A former toy maker who converted to die making during the war years is back in the toy manufacturing field. Another newcomer to the tool and die industry is turning to bobby pin production.

About one-third of British machine tool output is being sold in export markets. That is below the government target of 40% and is close to the prewar average. Total British production this year should reach 34 million pounds sterling (in 1938 it was 15 million). Prices are double those just before the war. India was biggest export market last year, with Australia next.

Metalworking today employs 5,660,000 wage earners in 57,800 plants, according to estimates of **American Machinist** editors as result of work on Mid-Century Inventory of Metalworking Equipment to be published Nov. 3. This compares with 5,825,000 employees in 59,000 plants in 1947 and shows remarkably little shrinkage from the peak postwar period.

Poland will spend huge sums on her metalworking industries in 1950-1955. Output by 1955 is to be 2½ times greater than in 1948, or six times bigger than prewar. About 40 new factories will go into production, requiring 1800 new engineers, 8000 technicians and 50,000 workers. Largest gain is scheduled in automobile industry which is to reach "European standards."

Report on effects of five-year depreciation policy for new production equipment is in rough draft stage at Department of Commerce. Secretary Sawyer wants to know how much taxes industry would save under such policy and how much demand for machine tools might be aided. Treasury is said to be cooperating in this report.

Gaging Metalworking

The metalworking industries are looking up. August showed a gain over July, and September promises a further rise. The automobile industry still is going full tilt, or close to it. Household appliance makers are doing better. The plants of one manufacturer of a diversified line of products, for instance, are running at 80%, compared with 50% two months ago.

Industrial machinery demand is on the upgrade. Machine tools and other metalworking equipment have recovered from their early summer low, thanks partly to export sales sparked by ECA money. The fall season, from the standpoint of production (and that means manhours worked), appears more promising than it did back in July.

Comeback in Machine Tools

Machine tools are staging a comeback in both orders and shipments. In August, new orders were up an estimated 10%, according to preliminary figures. Output increased roughly 15%, part of the upturn coming from the fact that vacation shutdowns were widespread during July.

Still, neither July nor August was anything to shout about. But September gives promise of at least a modest increase. The flow of ECA orders, particularly for the heavier types of machine tools, is helping current business. ECA officials have not wavered in their opinion that cuts in their funds for fiscal 1950 will affect machine tool buying in this country very little if at all. The kinds of machines being ordered here cannot be obtained elsewhere. Many types of machines are built only in the United States; others cannot be secured in Britain because British builders are quoting deliveries of one to three years.

► Some 16.5% of all the machine tools bought by ECA participating countries during fiscal '50 will come from the United States.

Fiat Buying Heavily Here

Fiat, famed Italian manufacturer, provides the most spectacular purchases of machine tools and other production equipment. On top of large orders placed the past four months, it has allocated $700,000 more machine tools to U.S. builders. In addition, a Fiat buying mission will arrive in this country next month. Export business this year represents about one-fourth of all machine tool bookings.

► Machine tool industry is more optimistic about the final quarter. It visualizes an improvement over September. There is a chance that production this year may touch last year's total—$286 million—but if it does, a sizable spurt will be necessary in the final three months.

Demand for mechanical and hydraulic presses has improved. That is true also of press brakes. A good share of incoming orders is from small shops.

No Special Tools for Tito

Look for Washington to allow Tito to buy certain types of machine tools. But authorities will be on guard against allowing him to get specialized tools for munitions manufacture. Even though Yugoslavia's military forces are completely supplied with Russian materiel, State Department has told Tito that he'll have to get along now with what little production he has.

First step in development of French West Africa as a dollar earner (approved by ECA) calls for $4.4 million of railroad locomotives, diesel engines and box cars. They will be furnished by Whitcomb Locomotive Co. and Magor Car Corp.

Outlook Good for Exports

Exports of metalworking equipment in last half of 1949 will be as large as the total ($97.4 million) in the January-June period, and may be greater. Reasons: (1) Most of equipment to be shipped between now and January has already been ordered and dollars allocated by importing countries; (2) restrictions on shipments to western Europe have been eased by Office of International Trade.

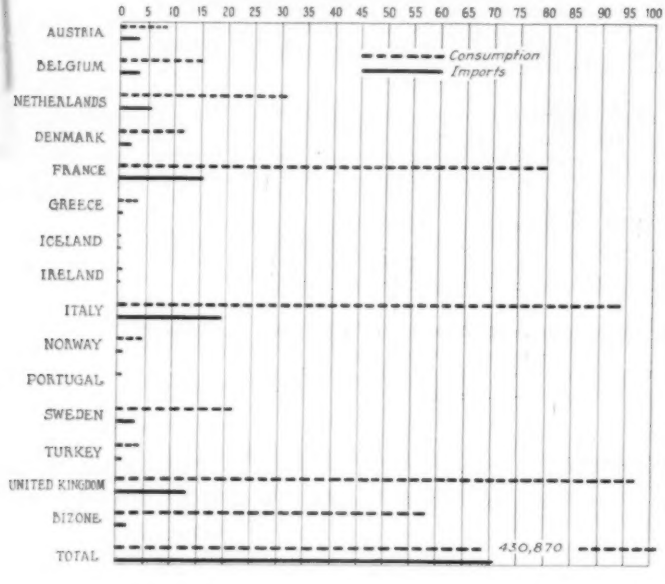
Metalworking is likely to be helped by a recovery in industrial building. Up to August it was off sharply (28%) from last year. Contracts awarded in August were more than triple July's and more than double those in August a year ago. Responsible for gain: notable decline in cost and recovery of confidence by industrial leaders.

Malleable on Firm Basis

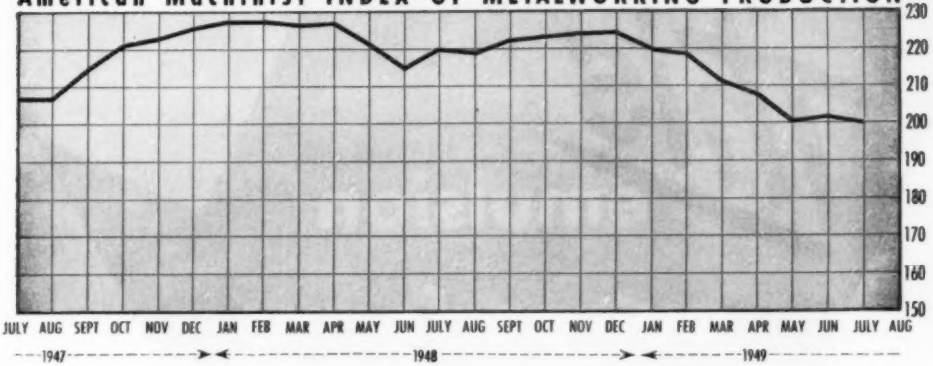
Malleable iron casting industry, which had a drop in business of 30

$71 MILLION FOR O.E.E.C. TOOL BUYING HERE

(Chart shows ratio of consumption to imports from U.S. by participating countries, in millions of dollars.)



American Machinist INDEX OF METALWORKING PRODUCTION



INDEX	COMPONENTS				
	MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANSPORTATION EQUIP.	OTHER METALWORKING
July 1949 (preliminary) 200	198	191	234	279	135
June 1949 (revised) 202	203	194	238	281	137
July 1948 220	250	226	229	305	147

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

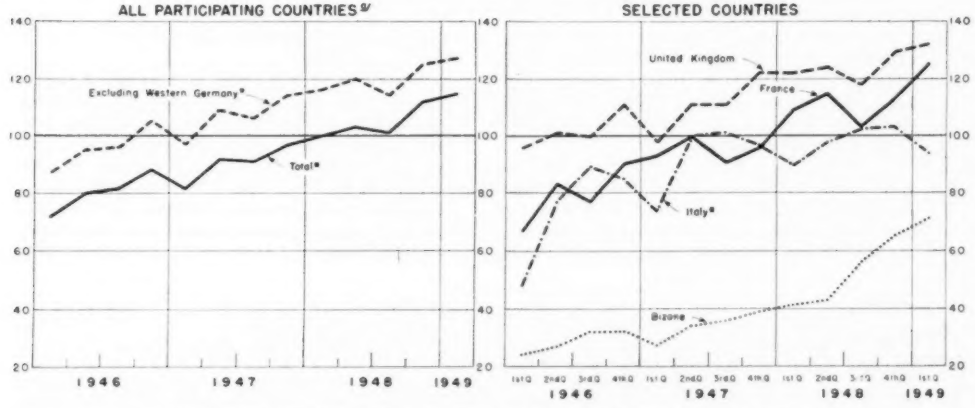
40% during first six months of this year, is leveling off on a firm basis at somewhat above the low point reached during the decline. Heavy demand from the automobile industry helped companies through the worst days. New orders from that source are being buttressed by bookings from other industries.

► Reports from contract tool and die shops do not make cheerful reading, though some improvement is evident. Backlogs have edged up from a five-week national average to six-and-a-half week average. But business is very unevenly distributed. Certain shops are virtually without any work; others have orders to keep them busy for five months. Detroit shops, in an effort to keep their working forces together, are reaching out into other centers and taking business which they normally would not touch. Shop-owners appear to be a little more optimistic about the outlook.

Little Change in Steel

The steel situation has not changed much, with operations in the 80-83% range. Just how much buying has been done as a hedge against a possible strike is anyone's guess. Probably it has not been too much. The automobile industry has been the main bulwark of demand. Without its strong support, steel mills would have been scurrying around for orders.

E.R.P. PRODUCTION HIT POSTWAR PEAK IN FIRST QUARTER



a/ Total excludes Luxembourg, Portugal, Switzerland, and Turkey. Not adjusted for seasonal variation

*Revised.

Index: 1938 = 100

This emulsion out-performs cutting oil

MACHINE:
No. 3A, Warner & Swasey Turret Lathe.

PART:
3" [illegible]" tapered flange, normalized S.A.E. 1040 steel forging.

OPERATIONS:
Drill 3" from solid, turn O.D., turn face, chamfer, tap tapered thread.

RESULTS:
With an emulsion of Texaco Soluble Oil Heavy Duty, threading speeds were same as when sulphurized cutting oil was used, but threads produced were smooth and passed critical inspection, machine output was increased, unit costs were reduced. Finish on all operations was excellent.

Texaco Soluble Oil Heavy-Duty increases machine output, reduces unit costs. Assures cleaner plant.

Emulsions made with *Texaco Soluble Oil Heavy Duty* are out-performing straight cutting oils on many jobs, such as broaching, drilling, turning and threading. They cool the work better, assure faster production and longer tool life.

In addition, there is less carry-off from emulsions with *Texaco Soluble Oil Heavy Duty*. This means savings in material consumption as well as in clean-up expense. These emulsions are highly stable and are not affected by normal contamination with the machine lubricant.

There is a complete line of *Texaco Cutting, Grinding and Soluble Oils*. A Texaco Lubrication Engineer will gladly help you select the right ones to give you greater output and lower costs whatever the metal or your method of machining it. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Teamwork Pays Out

Remember the major league baseball team owner who set out to buy his club a pennant and a world's series? He had plenty of money with which to acquire star players. He spent his money freely, even recklessly.

He gathered around him an aggregation of stars so luminous that it made the baseball world blink. But his plan fizzled. The pennant was as elusive as ever. The stars didn't seem to be able to work as a team.

The ambitious owner would have been better off if he had possessed players of less average ability who could work together successfully. In fact, his boys were beaten by just that kind of team.

Teamwork then is an essential ingredient of success in baseball. It is as necessary in metalworking, however, as in baseball. And it is particularly desirable in these days of high costs and keen competition. It isn't hard under today's conditions to turn a good profit into a loss unless management all along the line is constantly on the job.

What every good metalworking management is seeking is teamwork. When it gets teamwork, it should make every effort to keep it.

It is desirable, under the circumstances to promote teamwork aggressively. How can it be done?

President C. E. Wilson of General Motors suggests six basic principles upon which teamwork depends. These principles should serve "to guide the day-to-day operations of a business." He uses them in his company's operations. They are:

1. Put right people in right places. Employees should be carefully selected and placed.

2. Train everyone for the job to be done. Employees thus will be better qualified to do their work. Their achievements will be limited only by their ambitions and abilities.

3. Make the organization a coordinated team. Employees should be formed into effective operating units, which should be coordinated and administered with minimum friction.

4. Supply the right tools and the right conditions. The better the tools, facilities and working conditions, the more can be produced with the same human effort and the lower the cost.

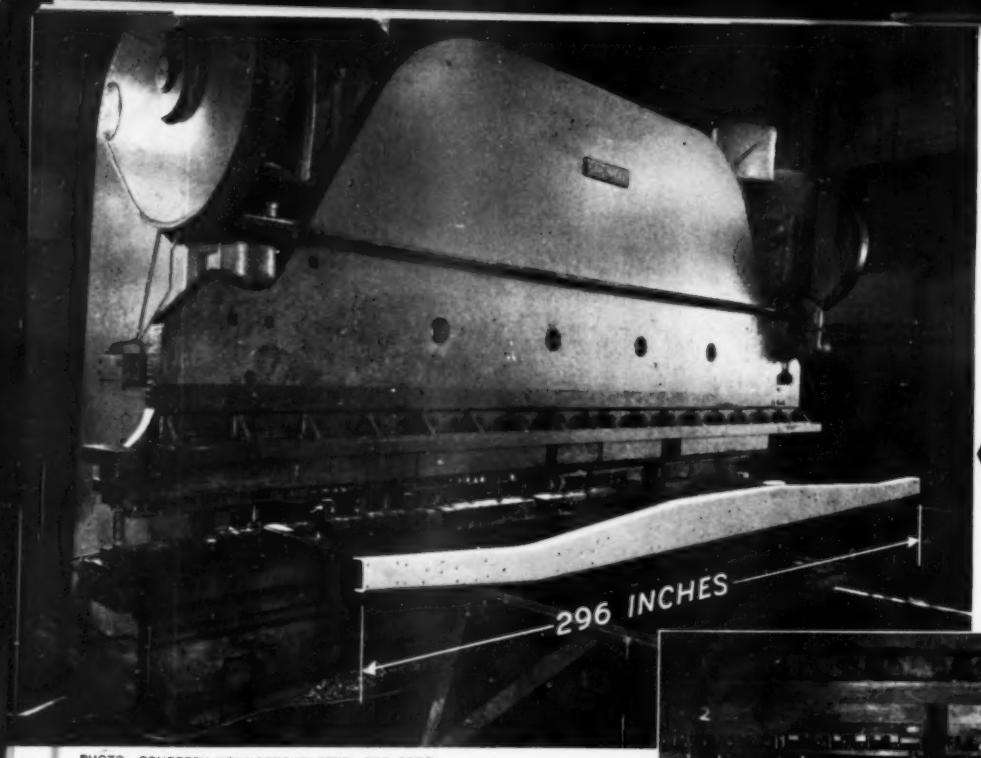
5. Give security with opportunity, incentive and recognition. Each employee should have sound incentives for working. They include fair compensation, recognition for results produced, reasonable security, and opportunity and hope for advancement.

6. Look ahead and plan ahead for more and better things. Superior products should be produced and distributed. They should be attractive and should meet the demands of customers. To make such products possible requires research and a policy of continuing product development and improvement.

Put these six principles to work, Mr. Wilson believes, and you will have that necessary ingredient of success: teamwork. More than that, you are likely to have a very successful management and a prosperous business.

Burnham Finney

EDITOR



Material: ⅜" mild steel. Maximum number of holes: 104. Maximum diameter of hole: 1⅛".

A close-up of the punch and die setup which gives 116 combinations.

PHOTO—COURTESY YOUNGSTOWN STEEL CAR CORP.

PUNCHING

104 HOLES EVERY 10 SECONDS

The multiple punching of these holes must be very rapid; however, another important requirement is the maintenance of accurate location, and the spacing of one hole from another.

The assembly which follows is smooth and certain—no costly misfits on these 24-foot trailer frames.

On this Cincinnati Press Brake the spacing, the number of holes or the size of the holes may be changed quickly and economically, as required . . . or the brake may be used for many other operations—all accomplished with minimum time loss and at low cost.

Write for Catalog B-2. It illustrates many applications for the press brake and press work performed on Cincinnati Press Brakes.

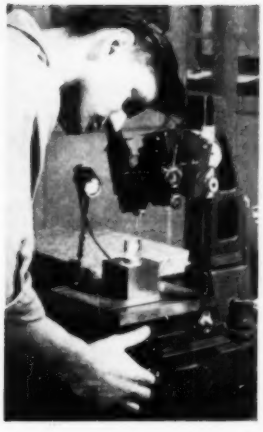
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

Compressor blade has airfoil section with empirically developed curves. It is twisted from top to bottom at an uneven rate and does not have a single straight line. Locations of sections over the base are designed to produce almost pure tension

MASTER MEASURING SYSTEM CHECKS JET-ENGINE BLADES



Properly applied, a modified toolmaker's microscope can measure curved surfaces of turbine blades within ± 0.0003 in.

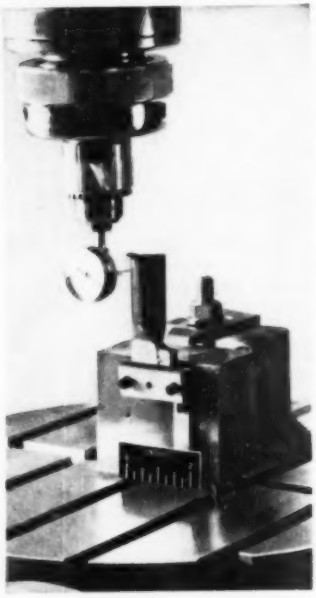
BY DAN WHITE
AND
HENRY MELTZER
National Advisory Committee for Aeronautics

MEASUREMENT of blades for jet-propulsion engines has always presented problems not encountered in the usual shop inspection department. Until recently, pantograph-type machines could make blades as accurately, or possibly more accurately, than they could be measured. The National Advisory Committee for Aeronautics found it absolutely necessary to be sure that the coordinates of research blades were according to the design or to know how much they varied from the design.

Several machines have been offered for measuring jet-engine blades. In most instances, one type has been purchased by a blade manufacturer, who thus has no means of standardization. To be confident that measurements made are accurate, it is desirable to have at least two reliable methods of measurement so they can be checked against each other. Most production measuring machines are accurate to 0.001 or 0.002 in. By careful standardization, it would be possible to improve this, as all of them have higher potential accuracy. It is therefore highly desirable to have a master system to standardize measuring machines now on the market.

The system described in this article is such a master system. It is much too slow for routine testing but, if properly applied, gives the necessary accuracy to standardize other machines.

Early attempts to measure blades included use of optical comparators, dial gages, layouts, jig borers



Dial indicator mounted in a jig-borer spindle can be used for measuring blade contour, but variations in readings due to indicator spindle deflection limit accuracy to 0.005 in.

and guillotine gages. All of these were exceedingly slow except the guillotine gage which, unless standardized, is extremely inaccurate.

One method was to mount a dial gage, selected for minimum spindle looseness, in a jig borer. By use of the table measurements the blades could be positioned very accurately. Unfortunately, it is necessary to measure the ordinates by the dial-gage readings. The dial gage zeros accurately, but varies as the full scale is used. Measurements were then made in rectangular coordinates. To correct for the 1/64-in. radius of the anvil contacting the blades, a layout 32 times size was made.

The accuracy of this system was later proved to be in the order of 0.005 in. using a new dial indicator, due to errors not compensated for by the layout.

Some of the causes of error were deflection of the dial-gage spindle, variation in the rack, and lost motion. A dial gage is an excellent device for measuring flat surfaces, but when the surface is at an angle to the center line of the spindle, a horizontal pressure not only moves the spindle out, but tends to introduce frictional errors as well.

Investigation of dial gages showed that few were accurate throughout the entire scale, even if one was selected which was accurate throughout the whole scale when working on flat-surfaces. The side pressure introduced by working around a blade caused errors in measurement. Moreover the method of supporting a dial gage is seldom sufficiently rigid to prevent slight twisting from side pressure on the stem.

Any mechanical system using a flat or ball contact introduces errors in proportion to the size of this contact. These errors are more than 0.001 in. for most systems on at least some blades for every jet engine.

Ball Anvil Desirable

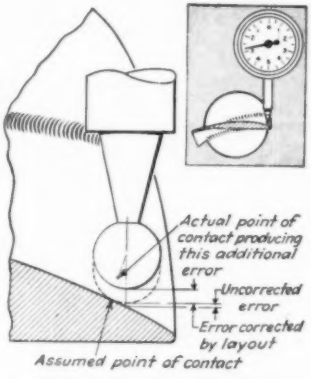
Obviously, a flat-anvil micrometer is unsuitable for measuring a piece that is curved in three dimensions. A ball-anvil micrometer is better, but with a ¼-in. radius anvil, the errors are considerable. A dial gage with a tight spindle and a 1/64-in. ball at the end produces these errors: The actual point of contact varies from the centerline of the spindle by a distance approximately equal to the radius of the ball times the sine of the angle of slant of the surface. This produces an error that can be partially corrected by a two-dimensional layout but can be eliminated only by a very complicated calculation. When this error is calculated it is found to be smaller than the error actually found when several measuring machines are used and the results checked against each other.

To eliminate some of these errors, a small-radius rigid stylus connected to a millivoltmeter can replace the dial gage in the jig borer. If a very small radius is used, the tedious layout can be eliminated and the accuracy maintained near 0.001 in.

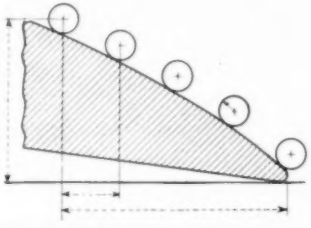
In one early method, the jig borer was set up with two dial indicators having tight spindles and 0.015-in. ball points. The blade was measured between the points for thickness. The blade was set up so the chord line would locate parallel to table, then the indicator readings at given stations were recorded. These readings were plotted on shrinkproof paper 40 times size.

The 0.600-dia circles were connected at tangency points with French curves. The distances from chord line to upper and lower surface layouts were scale measured and compared with specifications. This method would eliminate the errors caused by 0.015-in. ball point traveling over convex or concave surfaces, but a slight error remained from the twist of the blades. Also, this method was exceedingly slow and expensive.

In another method of measurement, 0.020-in. thick slices cut from blades were projected against a


Actual point of contact producing this additional error
Uncorrected error
Error corrected by layout
Assumed point of contact

Errors in measurement are produced even with the best dial indicators, because of the angular displacement of the point of contact of the ball with the curved surface of the work



Plotting indicator readings from a jig borer to 40 times scale is fairly accurate, but slow and expensive. Furthermore, it does not compensate for errors caused by the twist of the blade

10-times size layout made on celluloid on the optical comparator. Cutting off the blades caused bending; and removing of burrs and twist caused errors of about 0.002 in. Later, sulfur and graphite molds made from blade sections, projected and compared to 10-times size layouts also proved to be decidedly erroneous.

All these methods were very slow, expensive and inaccurate. The inaccuracy was demonstrated by the fact that no two methods gave identical results when measuring the same blade.

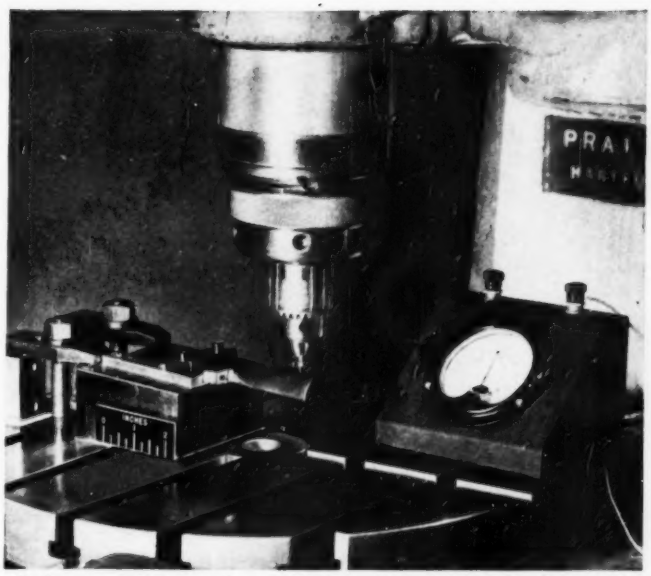
The Cleveland Laboratory of NACA is now fortunate in having two methods employing radically different principles that are in good agreement when measuring the same blade. One is an automatic photographic recording machine. The other, described here, is the modified toolmaker's microscope with dual microscope bodies and separate movable illuminators. With this, certain auxiliary equipment is required, including various holding fixtures for different-shaped blade roots, gage blocks, a thin plate for scribing a light line around the blade and also for setting the height of the focal plane of the microscope, and a special pointed scriber to produce a line less than 0.0003 in. wide and with less than 0.0001-in. burr.

All this equipment must be exceptionally accurate and very well cared for, because three or four errors of 0.00005 in. can easily produce an error of more than 0.0001 in., which is the accuracy desired.

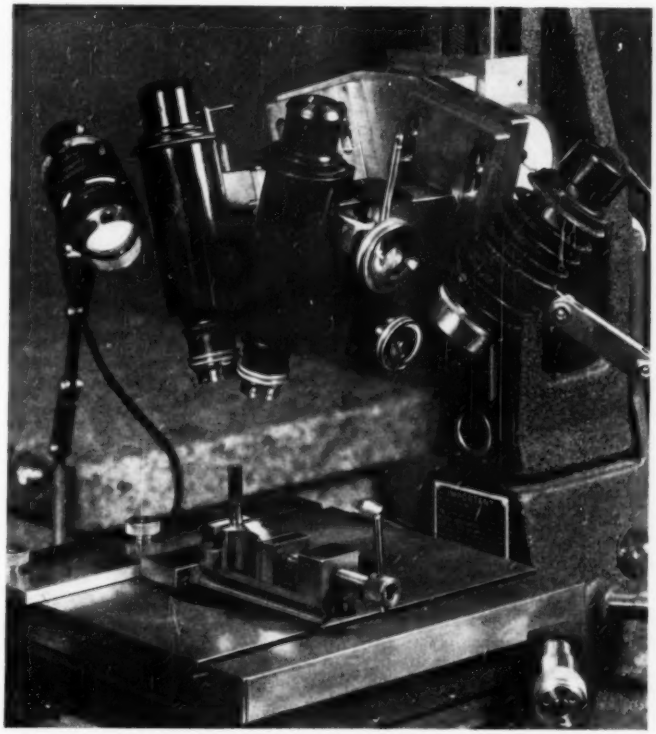
Method of Measuring

The measuring process starts by giving the blade a very light coat of layout ink and mounting it in a true fixture. One type of blade is machined to the threaded base and located in the compressor by this base, so measurement of location and angle of mounting are determined from it, as well as measurements of the blade section. This base is placed in a mounting block. Gage blocks are then placed on the mounting block, and a precision scribing table set on top of these.

The operator scribes a line about 0.0003 in. wide, using the table as



Jig borer used in conjunction with stylus having a 0.003-in. radius will eliminate layout work and produce accuracy near 0.001 in.



Special modifications to a standard toolmaker's microscope include provision of a dual mounting block and a second ocular system

Locating fixture for threaded-base blades must be accurately made to hold blade square

Special-pointed scriber is necessary to scribe a line not over 0.0003 in. wide on inked surface of blade

Dual-ocular microscope set up for checking focus and alignment with scribing table still in place

a guide. Theoretically this line is not needed because the very small depth of focus of the microscope produces a line or band of visibility about 0.001 in. wide and the operator should be able to find the center of this to 0.0001 in. Practically this does not work out, so a line is used. Great care must be exercised in scribing this line as it is easy for the operator to produce a line much wider than 0.0003 in. with large burrs and flaking off of the layout ink. Light brushing with a soft bristle brush removes any small lip of ink that may be raised in the scribing operation. The scribed line is carefully checked for any irregularity—usually the operator uses a high-power loupe for this purpose.

The blade in the support block is now placed on the table of the toolmaker's microscope against the angle plate. Both microscope bodies are then focused on the scribing table. Both lenses are focused to one fine crossline so crosshairs intersect on a common point. When the focal distance is correct, the alignment of crosshairs and common point will remain stationary regardless of whether or not the operator changes his actual sighting position.

The next operation is to check the setup for accuracy. This check need be made only occasionally to show that the equipment is in good working order. A check plate of known thickness is set on the scribing table. One edge of this is lined up by rotating the table until it can be moved forward and back with the edge always showing at the intersection of the crosshairs of one ocular. The table is then moved with the cross feed micrometer until the other edge is lined up with the other ocular. The reading of the micrometer should check the known thickness of the check plate within 0.0001 in.

Locating the Blade

Now that the microscope is set up and in good working order, the blade must be properly located for measuring. As the fixture located it in the correct vertical position, it only remains necessary to rotate the table until the coordinates coincide with those used in specifying the blade. In NACA drawings, a line tangent to the lower surface of the blade is used as the zero for abscissas. This line is easily located on the toolmaker's microscope so the method of laying out a blade in the drafting room also corresponds to the method used in measuring it.

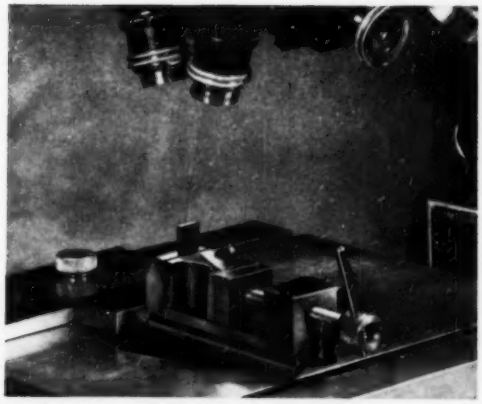
The microscope is now set up to measure one blade section. To measure the blade, the operator moves one screw 0.025 in., moves the other screw until the line is centered on the cross hairs, reads both micrometers and proceeds with the first screw 0.025 in. further, or whatever increment is specified in the table of coordinates, observes the ocular and reads the micrometer. He repeats this at 0.025-in. increments for the length of the blade and then comes back the same way on the other side. For a 1-in. chord, he makes at least 80 readings for each section of the blade. A good operator needs about 4 hr to measure a blade at three sections. At the end of this time he is unhappy and suffering from eye strain, but he has measured a blade and the measurements are accurate.

Certain tests were made to prove the accuracy of the process and included measuring a 0.250-in. gage block set vertically. Measurements on this agreed to ±0.0001 in. When the same block was set up at an angle, the worst measurement was 0.0003 in. from the calculated thickness in a plane parallel to the microscope worktable.

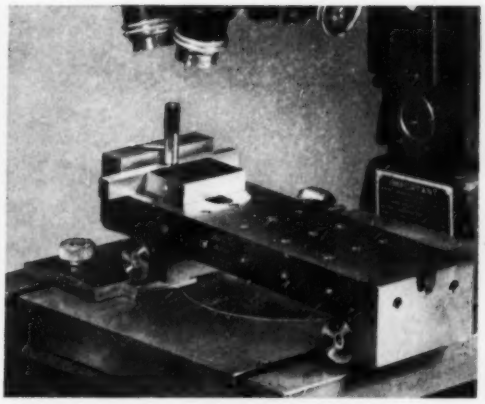
These measurements were made by a relatively unskilled operator, and could be bettered by a highly skilled one.

Another check was on a vertical proving bar on which the maximum error was again 0.0003 in. with the readings taken at stations 0.025 in. from the tangent. At this position, an error of 0.0001 in. in station will produce 0.0003-in. difference in measurement.

The final and conclusive proof of accuracy was to set the cylindri-



Accuracy check made with a gage block shows the system to be accurate within ±0.0001 in.



Conclusive proof of accuracy is made by checking a proving bar set at an angle to the table.

cal proving bar at an angle to the table. Here most of the errors possible in a blade are presented in a bar of known dimensions. Again maximum error of 0.00031 in. was found.

This method has now been used for three years at NACA. It has been tried against several commercial measuring machines, as well as several special devices made by the laboratory. As more rapid devices are now employed, it is used as a master measuring system and all other blade-measuring machines are checked against this dual-ocular microscope.

While this type of measuring system is far too slow for production measuring it is an excellent device to calibrate other airfoil blade measuring machines now being offered by several manufacturers.

As an accurate research tool for experimental blades, it has not yet been surpassed by any machines or devices known to the authors.

Tips FOR TOP SHOP MEN

303. Know your men's hobbies. The man skilled in sports probably has superior coordination, the man who paints or carves probably has some artistic ability, the man who putters around the house probably has considerable ingenuity. When any of those specialties is required, choose the man who has shown evidence of ability in it.

304. The method or process you're surest is the ultimate is the one most susceptible to improvement. Nothing is so dangerous as the method you're certain is the last word.

305. Be lazy, in a constructive way. Save your time and energy by doing things when they should be done—or even before. The soundly lazy man gets things done on schedule and avoids the hard work of catching up.

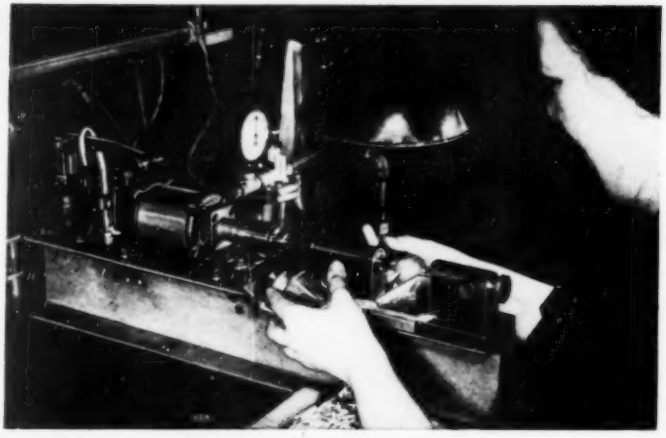
BOTH OF THEM JUG HEADS KNOW THE BOSS' HOBBY IS MODEL BUILDIN'- WHY DO THEY TRY TO GET HIS NEW OFFICE MAN IN A JAM?
THEY ARE IN THE JAM- THE NEW OFFICE MAN IS ALSO THE NEW SON IN LAW OF TH' BOSS!
IT IS HIS DESIRE TO ADJUST SOME SORT OF A MECHANICAL DEVICE IN HIS HOME —SAID YOU BOYS WOULD KNOW WHAT TO SEND ALONG.
"THE TRUSTING SOUL"

When caution and cupidity conflict

SHOP SHOTS

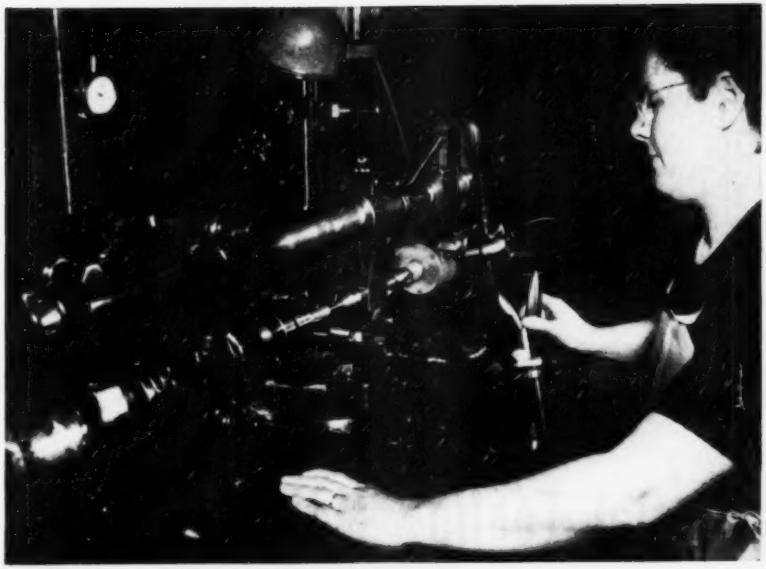
FROM SANGAMO

Elbow in guide arm permits staking tool to be located above each post position in meter frame plate. Fixture plate is bored to support posts vertically in proper relation with plate, so ends are staked tightly when spread with punch. Arm in front of fixture raises pins under post, lifting assembly out of fixture. Fixtures for different frame assemblies can be interchanged on base of staking-guide assembly



Pneumatic bench fixture stakes 0.025-in. steel pivot in each end of aluminum worm shaft for Type J meter gear train. Pivots are centered accurately and inserted at controlled pressure with little need for attention from operator. Work cycle is initiated by depressing plunger of an enclosed Micro Switch on each side of fixture at the same time

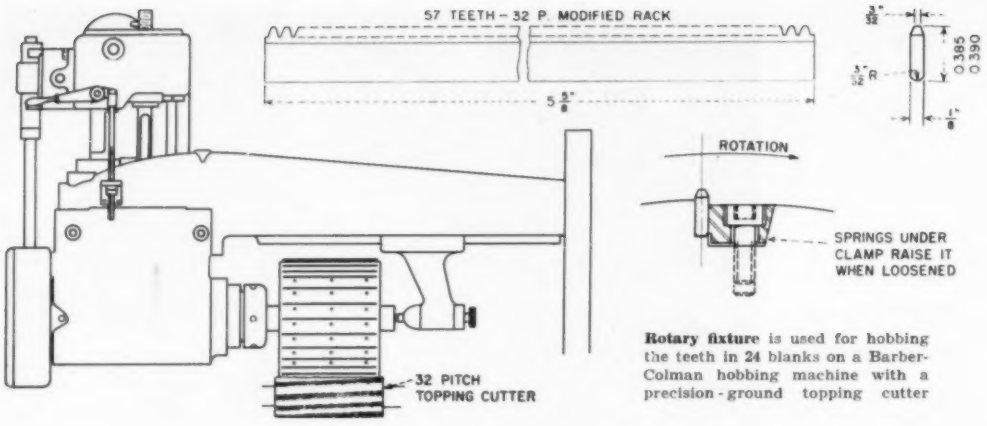
Burrs formed inside brass terminal sleeve by cross drilling and tapping operations are shaved off with short tool-steel broach on air cylinder controlled by pedal valve. Workpiece is located in front of tool on fixture plate by operator, who transfers terminals from bin at her left. Right hand moves finished piece into chute to tote box



Air cylinder connected to spring-loaded tailstock spindle of No. 3 Barber-Colman gear hobber insures application of same pressure each time arbor load of gear blanks is positioned between centers of machine, thus eliminating bent arbors and eccentric gears

Stethoscope is used by Sangamo inspector for final test of gearing in new Type H synchronous motors. Test panel holds ten motor assemblies and is wired for all final inspection operations

Safety of operator on vertical diecaster is assured by solenoid-operated rods which automatically move between platens when dies are opened. Links connect levers holding safety bars, so single solenoid moves both bars into and out of position. Diecaster sets spindles exactly vertical in the center of meter disks



Rotary fixture is used for hobbing the teeth in 24 blanks on a Barber-Colman hobbing machine with a precision-ground topping cutter

Special Tooling Makes Precision Racks and Pinions

Computing scales must be to close tolerances to give honest weight, so mechanism elements must be similarly close. Here's how one plant does it

BY H. J. WILLIAMS

RACKS and pinions for computing scales must be made to extremely close tolerances on tooth form and circular pitch dimensions because they rotate the chart which indicates the weight and price of the item being weighed.

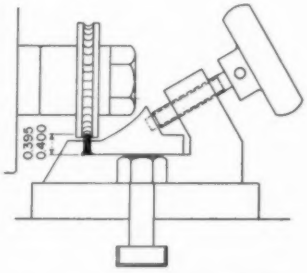
Racks are made from 1/8x13/32 x91½-in. strips of sawed clock brass cut into 5⅝-in. lengths on a power shear, and degreased and straightened. A 3/32-in. radius is milled on one edge, holding the over-all width to 0.395-0.400 in. Angles of 8½° are milled on each side of the opposite edge on which the teeth are to be cut.

Machines are 0-8 Cincinnati mills, using identical fixtures. Cutters are mounted on stub arbors to eliminate interference with the clamp knob on the fixture. Both machines are set for climb milling to produce a better finish and simplify clamping.

These blanks are then loaded, 24 at a time, in a drum-type fixture, approximately 8 in. in diameter, and the teeth are cut and the width finished to 0.385-0.390 in. on a Type A Barber-Colman hobbing machine equipped with vertical feed. The cutter is a 32-pitch precision-ground topping rack cutter, 6 in. long, with spiral gashes. Coolant is used to prevent distortion.

By using a topping cutter, the operator has to check only the width of the finished rack, because the tooth form and depth will be correct whether the high or low limit is used on the 0.385-0.390-in. dimension; assuming, of course, that the hob is set correctly, running true, and properly ground.

In operation, the drive gear end of the hob slide swivel is swung away from the machine column and the hob spindle is aligned parallel to the center line of the work spindle. One end of the fixture is



Setup for milling 3/32-in. radius on edge of rack blank on a Cincinnati mill, using a form cutter on a stub arbor to avoid interference

supported on the center in the overarm bracket. It is necessary to use a short center so the gear-drive housing will clear the overarm bracket.

The hobbing machine has a double-thread worm and the index gears are:

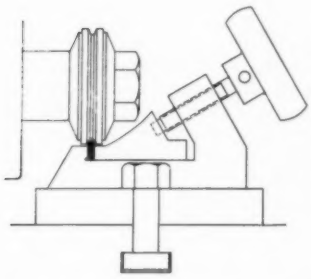
$$\frac{24\times 36}{97\times 100}$$ Drivers / Driven

40-tooth idler on special bracket.

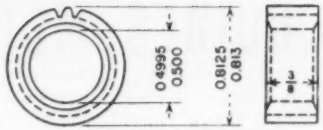
The vertical feed is geared for 0.001-in. feed per rev, and the automatic stop is set to allow for hand feed on the final 0.002 in. of cut. The cutter is made to produce a No. 2 form tooth to minimize interference in operation and produce a smoother working mechanism. The hobbing machine and the two mills are so arranged that they can be handled by one operator who produces 24 completely finished racks per hr.

Reason for cutting the teeth on a rotating fixture is that the rack has a certain amount of float and may not always be set at exactly 90° to the center line of the pinion. The variation is slight but is sufficient to cause roughness in operation if the teeth were cut straight. The former method of cutting was to load 12 blanks in the same holder as now used and cut them to width by turning between centers in a lathe. At the same setting the teeth were cut by a cutter mounted in the toolpost, and a leadscrew geared to produce a lead of 0.0982 in. for 32 pitch.

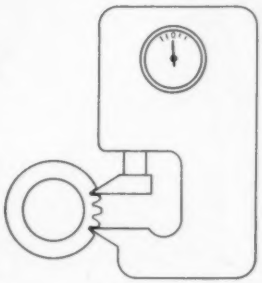
While it was possible to produce satisfactory racks with this method, it was also possible to produce considerable scrap because results depended too much on the skill of the operator.

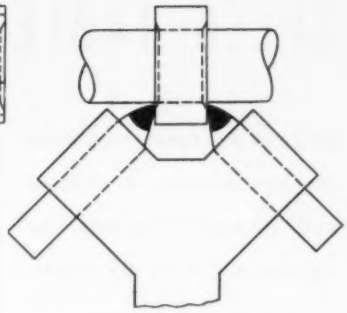


Both edges of straight side of blanks are beveled to a 8½° angle in the same type of fixture used for cutting the radius



PINION 32 PITCH 24 TEETH





FACING SIDES TO $\frac{3}{8}$ WIDTH

Setup for machining pinions, showing dual facing tools and special gage, left, used by operator for checking accuracy of tooth spacing

Pinions are made from special alloy bronze bars, ⅞ in. in dia. and 36 in. long. They are rough turned to 0.820-0.825 in. in dia, drilled, reamed, chamfered and cut off on a small turret lathe because the loss in bar ends would be too great on an automatic. The other side is chamfered in the turret lathe, using a collet stop to control depth of chamfers.

The hole is broached to 0.4995-0.500 in. dia, using a push-type broach on a small arbor press, 0.001 to 0.003 in. being allowed for this operation. Both sides are faced to ⅜-in. width on a mandrel between centers in a lathe, using carbide-tipped tools in a special holder.

Four blanks are placed on an arbor and 24 teeth cut and the OD finished to 0.8125-0.813 in. on a Barber-Colman hobbing machine, using a precision-ground topping hob. Coolant is used to prevent distortion. The tooth form is checked on a Wilder projector because it is important that the hob slide swivel be set at the correct angle to produce a perfect tooth.

Formerly, the teeth were cut on a Waltham automatic indexing mill using a single cutter, roughing and finishing operations being performed at the same setting. Variations in indexing caused trouble and a special gage was used to check over 3 teeth. A tolerance of plus or minus 0.0001 in. was allowed, any greater variation being cause for rejection. This gage is still used by the operator and while there is no noticeable variation in tooth spacing, it gives him a check on the condition of the hob and when to move it.

BIGGEST BORER

BIGGEST BORING MILL ever built in England, and perhaps in the world, a 50-ft. machine, has been constructed by George Richards & Co., Ltd. The table is 33 ft. in dia, but the main uprights carrying the 47-ton crossslide are arranged to slide on horizontal beds, and when fully retracted permit work up to 50-ft swing to be accommodated. Each toolholder has an 8-ft down feed, and maximum height of 13 ft is admitted under them. Total weight of the machine without motors is 475 long tons.

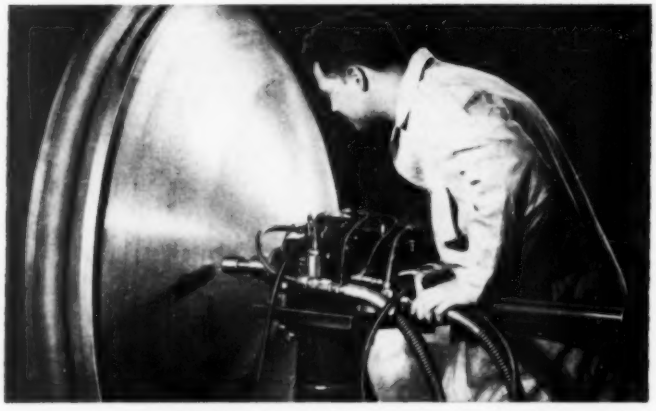
Handling the massive components required some tricky teamwork with two cranes, and when the bed was laid down for erection, clearance between the structural columns in the plant was only ½ in. at the back and 4 in. at the front. The table is designed to carry loads up to 100 tons and the main drive motor is 125 hp.

Lubricating pumps are interlocked to table, cannot be started until oil flows through main bearings.

SPEED TABLE GUIDES METAL SPINNERS

Based on a comprehensive study of case histories, a chart of best spinning speeds takes the mystery out of an old process

BY CHARLES F. BENVIE
ROLAND TEINER CO., INC.
Everett, Mass.



Physical labor in spinning large, heavy work can be substantially reduced by the application of power-operated tools

MOST metals can be spun with fairly satisfactory results at any one of several different speeds, but for each different thickness and diameter there appears to be one best speed which will yield maximum production and quality with a minimum of effort on the part of the operator.

Until recently, spinning speeds were governed by the variations obtainable on the four-step pulleys with which most lathes were equipped, and intermediate speeds were controlled by the operator varying the pressure of the tool on the work. This was, in fact, one of the closely guarded trade secrets of the old-time spinner and was clearly reflected in the quality of different men's work.

Modern equipment, with belts and pulleys eliminated, offers a range of eight or more speeds and makes correct speed selection a more exacting proposition. The spinner has little time to develop an individualized pressure for each different product he makes. His ability to spin a variety of metallic alloys requires such accuracy that he needs a table to establish the speeds found by most spinners to be best suited to the job.

Preparation of such a table was undertaken by A. Roland Teiner to give his own employees a new approach to the problem of the best speed for the metal to be spun, and to eliminate much of the long training formerly necessary before an instinctive feel could be develdeveloped for the job.

The first step was to keep an accurate record over an extended period of every spinning job performed, noting the diameter, thickness, and speed used. The second step was the presentation of these data on a chart basis. A method had to be found to show that gages and sizes are close to a true geometrical relationship. For example, there are as many gage numbers between 0.005 and 0.010 in. as between 0.08 and 0.16 in. Here, 0.005 to 0.010 in. is a 0.005-in. range wherein there are six gages each as important to the metalworking man as the next six in another range. For illustration, the range of 0.08 to 0.16 in. is a 0.08-in. range which is sixteen times as thick as the 0.005-in. range and yet it has only the same number of gage points.

Applying this geometric type of relationship to the charting of diameters as well as thickness made possible a basis for an understandable chart. After this picture was developed, it was easy to interpolate from the table and draw a graph as on the accompanying chart. The case histories thus recorded show some interesting curves. Occasionally, there was a case history record that did not conform to these suggested curves. From this information and further research it was observed that speeds, like notes in music, seemed to have harmonics. Actually, there appeared to be several speed ranges for the same piece of metal, the same thickness and diameter. However, and this leads to one of metal spinning's trade secrets, there seemed to be a best speed for each metal when measured in terms of a standard operation. On this last basis, the relationships between thickness, diameter and metallic composition appeared very nearly in line with a simple curve.

An important point in the favor of spinning is the economic factor. Stamping equipment is so costly that unless quantities run into the thousands of pieces, it is cheaper to spin the articles. Furthermore, spinning can be combined with welding to produce an extensive line of parts.

The recent war accelerated the development of advanced techniques and it is now possible to spin harder metals, heavier thicknesses and larger diameters than ever before. Because of these advances, post-war industries are

THICKNESS AND DIAMETER

SPINNING CASE HISTORY RECORD

METAL	THICKNESS IN.	DIA IN.	SPEED RPM
ALUMINUM	0.015	¾	2400
	0.032	6	1225
	0.062	9	920
	0.090	14	525
	0.125	36	450
	0.250	144	112
COPPER	0.008	¾	2400
	0.015	5	1225
	0.040	9	1000
	0.062	14	575
BRASS	0.015	2	1225
	0.032	7	1000
	0.040	8	575
	0.050	12	525
	0.093	24	450
	0.125	36	325
	0.187	72	242
COLD ROLLED STEEL	0.025	2	1225
	0.032	7	1000
	0.035	9	920
	0.040	10	920
	0.109	18	575
	0.125	18	325
	0.125	25	242
STAINLESS STEEL	0.078	15	525
	0.078	36	375

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finding spun parts a practical answer to problems of reduced costs, improved products and speedy entrance into consumer markets. There is no long delay necessitated by the setting up of dies and presses, and intricate shapes can be made without extra operations.

Virtually any metal or alloy can be spun—aluminum and its alloys, steel, stainless steel, copper, bronze, brass, nickel, magnesium, Everdur, Monel and Inconel.

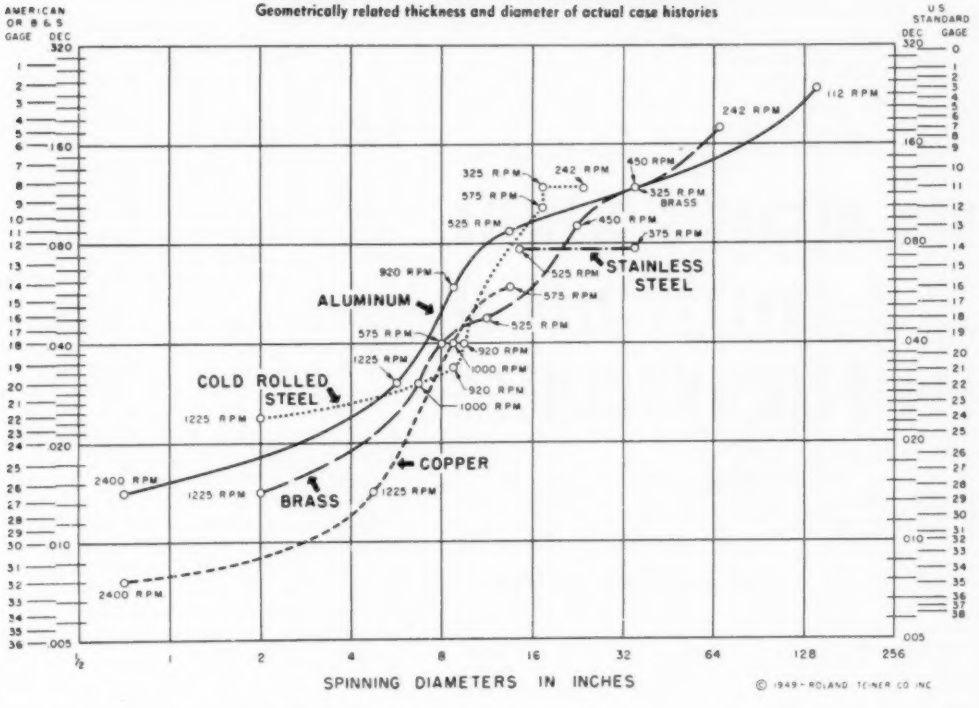
In addition to sheet metals, great strides have been made in the spinning of tubing. Expansion and reduction can be accomplished by cold spinning, but the application of heat widens the range. Contrary to popular belief, it is not necessary that large quantities be involved to utilize hot spinning.

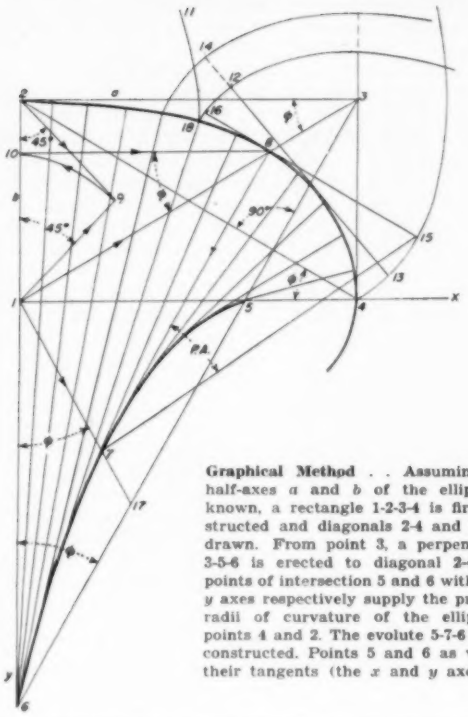
Advances have also been made in increasing the diameters spun. By using high speeds for small blanks and then testing progressively slower speeds for large sizes, actual speeds and new techniques have been developed for many parts. For example, 16-ft-dia hemispheres are no longer unusual, and the possibilities for even larger sizes have not been exhausted.

From a practical viewpoint, there may be a limit. The larger the blank, the greater the inertia and momentum. The greater these forces, the more critical becomes the shape and use of the tool. With large work, ordinary tools are not enough. Tools are usually made of hickory for the first operation of laying the metal down against the chuck. Then a tool of high-carbon steel forged to shape and fastened to a hardwood handle may be used to lay the metal up against the form. When large sizes and special deformations are involved, these tools are not adequate and the spinner must design special tools. Mechanical contrivances become increasingly important and each job requires its own tool engineering. For the larger jobs, lubricants such as soap, oils or greases are required: smaller sizes can use beeswax, tallow or petroleum jelly.

PERIPHERAL METAL SPINNING SPEEDS

Geometrically related thickness and diameter of actual case histories





Graphical Method . . Assuming that half-axes a and b of the ellipse are known, a rectangle 1-2-3-4 is first constructed and diagonals 2-4 and 1-3 are drawn. From point 3, a perpendicular 3-5-6 is erected to diagonal 2-4. The points of intersection 5 and 6 with x and y axes respectively supply the principal radii of curvature of the ellipse, at points 4 and 2. The evolute 5-7-6 is first constructed. Points 5 and 6 as well as their tangents (the x and y axes) are already available and it remains to find the position of the apex 7 of the curve. At that point, tangent 7-8 is parallel to chord 5-6. Point 8 of the tangent lies on diagonal 1-3 of the rectangle and its exact position is found by first drawing lines 1-9 and 2-9 at 45° angles, as shown, and by transferring the distance 1-9 to 1-10 and from there to point 8. Tangent 7-8 may now be drawn parallel to secant 6-5-3, and line 1-7, drawn at an angle ϕ (equal to angle 2-6-3) from the origin 1, will intersect tangent 7-8 at the point of tangency 7 exactly.

Base curve 5-7-6 may now be drawn with a French curve and ellipse 4-8-2 laid out as an involute of the base curve. From the ellipse various involute arcs such as 11, 12, 13, and 14 may be plotted by first subdividing the ellipse into relatively short and equispaced arcs, by drawing the corresponding normals to the ellipse as a series of tangents to base curve 5-7-6 at those points, and by rolling a straight line such as 8-15 without slipping and perpendicularly to the said successive normals in the conventional manner. Thus, at point 8 the radius of curvature of the ellipse will be equal to the distance 7-8, and the radius of curvature of the involute will be equal to distance 8-15, which in turn will be equal to the length of the elliptic arc 8-4. The pressure angle of the involute 4-15 at point 15 will be equal to angle 8-7-15.

NEW METHOD SIMPLIFIES CONSTRUCTION OF ELLIPTIC INVOLUTES

Graphical solution avoids complex mathematical functions

BY NIKOLA TRBOJEVICH
Dept. of Mechanical Engineering
Lawrence Institute of Technology

ELLIPSES and their evolutes and involutes now can be constructed with relative ease. Improving upon known methods, a procedure recently developed at National Broach & Machine Co. enables construction without calculation of any kind. Applications for the new method include planning for variable-velocity gearing, elliptical cams, and gear hobbing or shaving based upon the "clearanceless hob" principle. (This process, first discovered and patented[1] by the writer over 20 years ago, seems to be coming into vogue again and may become one of the most productive processes in gear-generating practice. The procedure of construction is illustrated in the accompanying layout.

Regarding elliptic involutes, a few basic truths may be mentioned: (1) The elliptic involutes are parallel curves in that they are equispaced about a constant set of normals. However, that does not mean that the successive involutes are identical curves or that the right and left branches of the same involute are identical. In fact they are substantially different from each other.

1. *Patents Nos. 1,820,409; 1,820,410; 1,867,782.*

(2) When two opposing involutes such as the involutes 16-12 and 4-15 are drawn from the same base ellipse, all chords tangent to the ellipse such as the chords 16-15 and 12-13 are of the same length and that length is equal, in turn, to the subtended-arc length 18-8-4. These chordal and arc lengths are incalculable by ordinary mathematical processes as they lead to the so-called "elliptic integrals,"—i.e., mathematical functions of extraordinary complexity which are too difficult for the average engineer or mechanic. Hence, the need for an accurate graphical method such as the one described in this article is readily seen.

(3) In constructing elliptical gears one should remember that in variable velocity gearing there is no such thing as a pitch line nor is it possible to have more than one tooth in contact at any one instant. On the other hand, it is possible to construct gears of this kind which will operate without any backlash whatever. On this subject more-detailed information can be found in the writer's patent No. 2,447,104, Aug. 17, 1948.

Mathematical Proof

In this graphical method, the determination of points 7 and 8 seems to be new in the art and it behooves the writer to prove the correctness of the graphical procedure mathematically.

The equation of the base curve 5-7-6 is well known in literature.[2] The curve is a portion of a four-cusped general hypocycloid, the equation for which is:

$$(a\,x)^{\frac{2}{3}} + (b\,y)^{\frac{2}{3}} = (a^2 - b^2)^{\frac{2}{3}} \qquad (1)$$

In this equation a and b are the major and minor half-axes of the ellipse and the coordinate axes x and y are oriented as in diagram.

First differentiate equation (1) with respect to x and denote the differential quotient with y':

$$a^{\frac{2}{3}}\,x^{-\frac{1}{3}} + b^{\frac{2}{3}}\,y^{-\frac{1}{3}}\,y' = 0$$

from which,

$$y' = -\left(\frac{a}{b}\right)^{\frac{2}{3}}\left(\frac{x}{y}\right)^{-\frac{1}{3}} \qquad (2)$$

2. *Granville, Differential Calculus, p. 188.*

The geometrical meaning of the differential quotient y' is that it is equal to the tangent of the angle at which the tangent drawn to the curve at that particular point intersects the x-*axis*. In our instance, referring to point 7 of the curve, tangent 7-8 intersects the x-axis at angle 6-5-4, the value of which is $90 + \phi$. From trigonometry: (3)

$$y' = tan\ (90 + \phi) = -\,cotan\ \phi = -\frac{a}{b}$$

because from the right triangles in the diagram:

$$tan\ \phi = \frac{b}{a} \qquad (4)$$

Substituting now equations (3) and (4) into equation (2):

$$y' = -\left(\frac{a}{b}\right)^{\frac{2}{3}}\left(\frac{x}{y}\right)^{-\frac{1}{3}} = -\left(\frac{a}{b}\right) \qquad (4a)$$

After raising both sides of equation (4*a*) to the third power:

$$-\left(\frac{a}{b}\right)^{2}\left(\frac{x}{y}\right)^{-1} = -\left(\frac{a}{b}\right)^{3}$$

from which, $\left(\frac{x}{y}\right)^{-1} = \frac{a}{b}$

or, $\frac{x_1}{y_1} = \frac{b}{a} = \tan\phi \qquad (5)$

in which the suffixes indicate that the coordinates pertain to the point 7 of the curve.

It is now clear that apex 7 of the base curve lies in the line 1-7-17. This line is inclined with respect to the y-*axis* at an angle ϕ, thus forming isosceles triangle 1-6-17. It is further obvious that triangle 1-17-5 is also isosceles from which it follows that chord 5-6 is bisected at point 17 by line 1-7-17.

As equation (1), denoting base curve 5-7-6 is practically "unplottable," because of the fractional powers of the variables which cannot be logarithmicised, we must turn for help to point 8 of the ellipse. At point 8 the normal to the ellipse is tangent to the base curve at its relative maximum point 7.

The equation of the ellipse is first written down:

$$b^2x^2 + a^2y^2 = a^2b^2 \qquad (6)$$

Next, differentiate as in the previous instance and denote the differential quotient with y':

$$2\,b^2\,x + 2\,a^2\,y\,y' = 0 \qquad (7)$$

from which,

$$y' = -\frac{b^2\,x}{a^2\,y}$$

But $y' = -\,tan\ \phi$, because tangent 8-15 of the ellipse intersects the x-axis at an angle $180 - \phi$.

$$tan\ (180 - \phi) = -\tan\phi = y' = -\frac{b}{a} \qquad (8)$$

therefore, equating (7) and (8),

$$-\frac{b}{a} = -\frac{b^2}{a^2}\cdot\frac{x}{y}$$

or $$b\,x - a\,y = 0 \qquad (9)$$

By separating the variables in the equations (6) and (9) the coordinates x_2 and y_2 of the point 8 of the ellipse will be found, namely:

$$x_2 = \frac{a}{\sqrt{2}}\ ; \qquad y_2 = \frac{b}{\sqrt{2}} \qquad (10)$$

Looking now at the diagram:

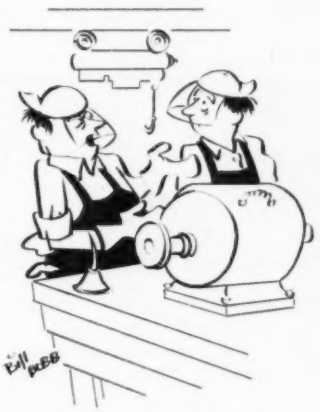
line 1-9 = line 1-10 = $\frac{b}{\sqrt{2}} = y_2$ and

line 10-8 = (line 1-10) $cotan\ \phi$

$$= \frac{a}{b}\frac{b}{\sqrt{2}} = \frac{a}{\sqrt{2}} = x_2 \qquad (11)$$

Hence it was now proved that the line 7-8 thus obtained is tangent to the base curve at the point 7 and normal to the ellipse at the point 8.

In this deduction the y-axis is positive in the *downward* direction for base curve 5-7-6 but is positive *upward* for ellipse 2-8-4. By this means standard equations taken from textbooks may be used provided that the signs of the first differentials are correctly determined as in this description.



Math Cuts Cost of Machining Studies

Dimensional analysis provides reliable information from incomplete metal-removing investigations

BY DR. M. KRONENBERG, CONSULTING ENGINEER
Cincinnati, Ohio

DIMENSIONAL analysis often permits substantial reductions in the cost of metal-cutting investigations. Through this technique, reliable information can be obtained from incomplete sets of experiments, thereby saving an appreciable part of the expense of collecting complete experimental data. Relationships between cutting speed, feed, chip cross-sectional area, tool life and other elements can be predicted by correlating the dimensions of these physical quantities in units of length, mass, time, and temperature. Conclusions thus obtained then can be verified by running a few checking tests.

For example, dimensional analysis enables the following statement: "If the temperature at the cutting edge of the tool increases 36% when the cutting speed is doubled, temperature will increase only 17% when the feed is doubled." Stated in a more general way tool temperature increases proportional to the $\frac{1}{2}n$ power of the chip cross-sectional area in cases where the temperature increases proportional to the n power of the cutting speed.

In this example, after it had been found from a complete series of tests that the temperature increased 36% when the speed was doubled, it was necessary to run only a few tests with doubled chip cross-sectional area to check the anticipated 17% temperature increase. Thus, it is possible to reduce the number of variables involved in metal-cutting investigations—variables that once were estimated to exceed 165 million combinations.[1]

Variables in Tool Temperature

The procedure of dimensional analysis as applied to metal cutting can be explained best by a simple example. We have selected for this purpose the investigation of the effect of cutting speed and chip cross-sectional area on the cutting temperature at the tool, when a cutting fluid is not used.

It can be assumed that the tool temperature t is primarily affected by the cutting speed v, the chip cross-sectioned area A, the specific cutting force p, the thermal conductivity λ and the specific heat per unit volume of metal removed h, which is the product of density and specific heat.

The specific cutting force p, which can also be termed "work done per unit volume of metal removed," can be measured easily and depends on the mean shear strength of the work material multiplied by a dimensionless quantity (one in which dimensions cancel, leaving a pure number), composed of the tool angles, the shear angle, and the coefficient of friction.[2]

Definite relationships must exist between the five physical quantities mentioned above and the tool temperature t, according to the principle of dimensional homogeneity which states that all terms in a

1. J. F. Allen, Exploring Carbide Possibilities in Single Point Turning, The Tool Engineer, Sept. 1946, Fig. 18

2. M. E. Merchant & N. Zlatin, New Methods of Analysis of Machining Processes, Experimental Stress Analysis, Vol. 3, No. 2, Formula 28.

Master curve of tool temperature in metal-cutting investigations

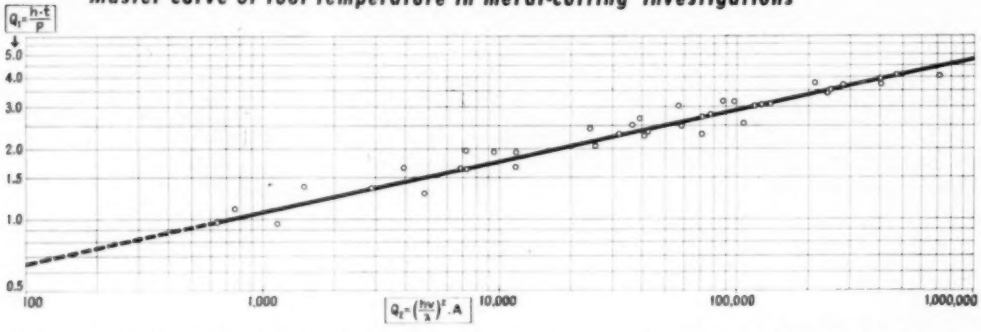


Fig. 1 . . . Composite curve expresses in one chart test results of all major factors affecting tool temperature during cutting. Q_1 and Q_2 are dimensionless products that can be set up through technique of dimensional analysis. Several charts are required to express same data by conventional methods

Dimensions of Physical Quantities Affecting Cutting Temperature of Tool

Physical Quantity	Symbol	Dimension
Temperature	t	θ
Chip cross-sectional area	A	L^2
Cutting speed	v	$L \cdot T^{-1}$
Specific cutting force	p	$M \cdot L^{-1} \cdot T^{-2}$
Thermal conductivity	λ	$M \cdot L \cdot T^{-3} \cdot \theta^{-1}$
Specific heat per unit Volume of metal removed	h	$M \cdot L^{-1} \cdot T^{-2} \cdot \theta^{-1}$

correct physical equation must have the same dimension. To find these relationships it is necessary to determine the dimensions of the physical quantities in units of length L, mass M, time T, and temperature θ, as shown in the accompanying table.

In the present example where six physical quantities and four dimensional units (length, mass, time, and temperature) are involved, it can be shown mathematically that only two dimensionless products are required for correlating all six quantities. To find these two dimensionless quantities, which shall be designated by Q_1 and Q_2, it is admissible to select any five of the six physical quantities for writing equations for Q_1 and Q_2, namely:

$$Q_1 = v^a \cdot p^b \cdot \lambda^c \cdot h^d \cdot t \qquad (1)$$

$$Q_2 = v^e \cdot p^f \cdot \lambda^g \cdot h^i \cdot A \qquad (2)$$

The exponents a, b, c, and d in (1) and e, f, g, and i in (2) must be so determined that Q_1 and Q_2 become dimensionless. This is very simple. Substituting the dimensions of the table into (1) we obtain:

$$Q_1 = L^a T^{-a} \cdot M^b L^{-b} T^{-2b} \cdot M^c L^c T^{-3c} \theta^{-c} \cdot M^d L^{-d} T^{-2d} \theta^{-d} \cdot \theta \qquad (3)$$

Next, all factors representing *length* dimensions are collected with their exponents giving $L^{a-b+c-d}$. The same method is applied to *mass* M, giving M^{b+c+d}; *time* T, giving $T^{-a-2b-3c-2d}$; and to *temperature* θ giving θ^{-c-d+1}.

For Q_1 to become dimensionless, the exponents of these factors must vanish,—*i.e.*, they must be put equal to zero and calculated from the four equations:

exponent of *length* L vanishes when: $a-b+c-d=0$ (4)
exponent of *mass* M vanishes when: $b+c+d=0$ (5)
exponent of *time* T vanishes when: $-a-2b-3c-2d=0$ (6)
exponent of temperature θ vanishes when: $-c-d+1=0$ (7)

Determining the four unknown quantities in (4), (5), (6), and (7) results in the conditions for Q_1 to become dimensionless, which is the case when:

$$a = 0;\ b = -1.0;\ c = 0;\ d = +1.0 \qquad (8)$$

Substituting these values for a, b, c, and d into equation (1), gives the first dimensionless product of the cutting variables, namely:

$$Q_1 = \frac{h \cdot t}{p} \qquad (9)$$

How chip temperature increases with time of cut

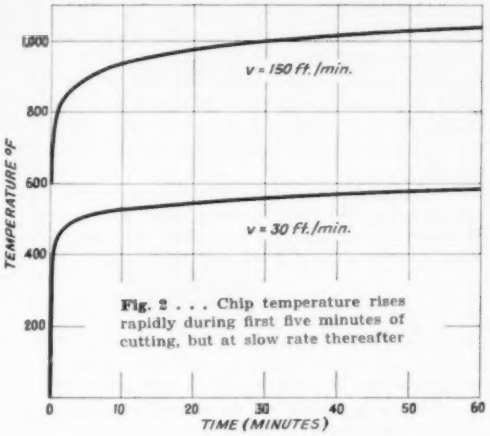


Fig. 2 . . . Chip temperature rises rapidly during first five minutes of cutting, but at slow rate thereafter

The other dimensionless product Q_2 is obtained in the same way from equation (3) which becomes dimensionless when:

$e = +2.0$; $f = 0$; $g = -2.0$; and $i = +2.0$

Hence:

$$Q_2 = \frac{v^2 \cdot h^2 \cdot A}{\lambda^2} \qquad (10)$$

Dimensionless quantities, such as those represented by equations (9) and (10), have not yet been used in metal-cutting investigations, although they are just as significant in the case of machining problems, as the Reynold number is when determining conditions of laminar flow in tubes.

Results from Cutting Tests

The relationship between Q_1 and Q_2 must be found experimentally by measuring temperature, cutting speed, chip cross-sectional area, and specific cutting force, for a limited number of cases.

Data where all these quantities have been measured simultaneously are available from tests carried out by Gottwein*. From them we have computed here numerous values for the two dimensionless quantities Q_1 and Q_2. These are plotted on bi-logarithmic paper, Fig. 1. All points lie reasonably well along a single straight line, although values cover a great range of cutting speeds, chip cross-sectional areas, cutting forces, temperatures, and so on.

Only dimensional analysis makes it possible to represent all tests by one single line. Ordinarily data must be represented by various diagrams. The two dimensionless quantities Q_1 and Q_2 therefore can be taken as the test results in "a nut shell."

It is only necessary now to derive the mathematical formula for the straight line in order to find the relationship between Q_1 and Q_2 and thus the relationship between all physical quantities involved. This relationship follows from:

$$Q_1 = k \cdot Q_2^n \qquad (11)$$

* Gottwein, Messung der Schneidentemperatur beim Abdrehen von Metallen, Maschinenbau, 1925 Vol. 4, 1129 ff.

where the constant k indicates the magnitude of quantity Q_1 when $Q_2 = 1.0$. It can be found directly from the graph by extending the line to the left. More important for generalizations than the constant k is the magnitude of the exponent n. The latter follows from the slope of the line and is 0.22 for Fig. 1.

The general formula for all tests correlating tool temperature with the five other physical quantities is found by substituting equations (9) and (10) into equation (11) and solving for t:

$$t = \frac{k \cdot v^{2n} \cdot A^{n} \cdot h^{2n-1}}{\lambda^{2n}} \qquad (12)$$

Equation (12) indicates that the exponent of the cutting speed v is twice the exponent of the chip cross-sectional area A. Hence, a change in cutting speed has a greater effect on tool temperature than a change in feed or depth of cut.

Using the value $n = 0.22$ in equation (12) gives:

$$t = \frac{k \cdot p \cdot v^{0.44} A^{0.22}}{\lambda^{0.44} h^{0.56}} \qquad (13)$$

Equation (13) indicates that tool temperature varies nearly proportional to the square root of the cutting speed and to the fourth root of the chip cross-sectional area. From equation (13) it is also possible to calculate the percent temperature increase for two different cutting speeds or two different chip cross-sectional areas. For example, when the ratio of two cutting speeds is 2:1, the resulting temperature ratio is $\left(\frac{2}{1}\right)^{0.44}$ which is 1.36. Hence, doubling the cutting speed produces a 36% increase in tool temperature. On the other hand, when the ratio of two different chip cross-sectional areas is 2:1, the resulting temperature ratio is $\left(\frac{2}{1}\right)^{0.22}$ which is 1.17. Thus, doubling the feed produces a 17% increase in tool temperature.

A straight-line relationship between cutting variables is often found in metal-cutting investigations when plotting tests on bi-logarithmic paper[4]. It therefore would not have been far-fetched to assume such a relationship in this case. This hypothesis would permit derivation of equations (11) and (12) even without tests.

Actual testing then would have been necessary only for a series of runs where the cutting speed was varied while the chip cross-sectional area was constant. This would have given the numerical value for the exponent n. A few further tests, varying the chip cross-sectional area, would suffice to derive the entire temperature relationship. Instead, numerous series of tests were run (as indicated by the points on Fig. 1), requiring considerable time and cost.

4. Kronenberg, Machining with Single Point Tools, Trans. Am. Society for Metals, September 1940; also Section 17, Tool Engineers Handbook, 1949.

Findings on Chip Temperature

Interesting results can be obtained from dimensional analysis even when using earlier investigations. It can be shown that the temperature of chips is affected by chip cross-sectional area in the same way as is tool temperature—namely, proportional to the 0.22 power of the area, while the cutting speed affects the chip temperature only to the 0.36 power. In this case, the time of cutting had been included and the analysis and tests indicated that chip temperature rises very rapidly during the first minutes of cutting, but only slowly thereafter. This is shown in Fig. 2. It will be concluded that such tests need not be run longer than a few minutes for giving substantially the desired information.

In a different analysis it was found that tool life increase at a considerably higher rate than the temperatures which two different tool materials can endure. For example, a tool material that can stand 1500 F instead of 1100 F, which is an increase of 36%, permits a tool-life increase of 130%. Hence, when a new tool-material is developed, useful information can already be obtained from observing the temperature that the material can stand and tool-life tests can accordingly be reduced.

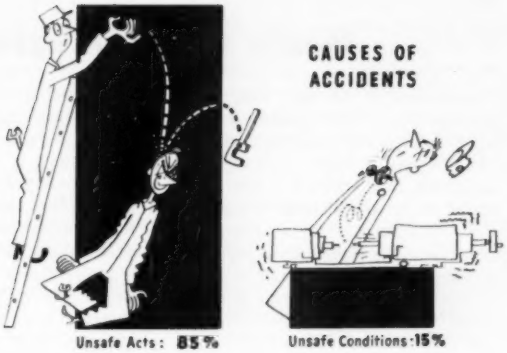
Basic Features of Analysis

Thus far, dimensional analysis is rather unfamiliar to production engineers because texts[5] on the subject do not deal with metal-cutting and machine-tool problems, but rather with the flow of fluids in pipes, heat transfer between wall and fluid, and similar topics of interest to power plant engineers. There is, however, no reason why this convenient method should not be applied to metal-cutting investigations.

Application requires, of course, some skill and training, particularly with respect to the selection of the physical quantities that must be taken into consideration. However, the likelihood of overlooking essential physical quantities is reduced to some extent by features inherent in the method. As an example, when observed values of one dimensionless product plotted against values of another dimensionless product do not lie fairly well along a curve or a line, it can often be concluded that some essential circumstances have been overlooked in the original selection of the physical quantities. Furthermore, it can happen that the simple equations involved in the process of dimensional analysis cannot be solved, indicating that the selected combination of physical quantities do not form a dimensionless product. The original assumptions of the quantities to be investigated must then be modified. On the other hand, it can also be found by a preliminary analysis, whether or not sufficient quantities are being taken into consideration in the tests.

It is therefore evident that considerable cost and time can be saved and experiments appreciably simplified by running a few checking tests to verify conclusion obtained from dimensional analysis.

5. E. Buckingham, Model Experiments and the Forms of Empirical Equations. Transactions A.S.M.E., 1915, Vol. 37, p. 263-296.



How to operate a SAFETY PROGRAM

BY ANDERSON ASHBURN, ASSOCIATE EDITOR

RECENTLY there was an accident in one metalworking plant on a special machine. This machine performed a milling operation on small parts fed to the cutter by a drum feed. The danger area was completely inclosed by a permanent, fixed guard except for the chip disposal area at the bottom. This area was protected by a curving chip chute. A special rake was provided to remove chips if they jammed in the chute.

Here, it would seem, every possible precaution had been taken to prevent injury. Yet the operator managed, by ignoring the rake and cleaning out the chips by hand while the machine was running, to get his hand caught in the cutter.

This accident, like 85% of all industrial accidents, was the result of a careless act. It is typical of the problems faced by management in trying to run a safe plant.

This accident happened in a large plant. It would have been less surprising in a small one, because accidents are far more frequent in plants with less than 100 employees.

It is a truism that accident costs, both direct and indirect, are a serious drain on a company's reserves, both financial and human. A 10% reduction in the frequency of accidents, in the average plant, means a saving of $1250 per year for each 100 employees.

Most of the effort in accident prevention must be directed at preventing careless acts. How can this be done? What are the methods by which the employees can be made conscious of the hazards? How can management stimulate a continuing interest in safety?

To help answer these questions, to provide a practical guide for safe operation in both small and large plants, and to summarize the way plants are dealing with the practical problems of safety operation, this report presents the well-established principles of safety organization and reports their practical application in several plants which have been conspicuous for their success in safety work.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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Basic Organization

SAFETY has its foundation at the top. This may seem a strange statement, but experience has shown repeatedly that until top management understands that time and money devoted to safety are "not only good morals and good ethics, but also good business," there can be no successful safety program.

Whatever the size of the plant, the manager must have a real and convincing interest in safety. He must also take the steps necessary to convince those under him that his interest is genuine. Some of these steps will be outlined later in this report.

Further, the experience of most companies is that safety should be a line responsibility, ultimately resting with the foreman. The foreman must understand that accidents are waste and that he must combat this waste just as he must combat other forms of waste in production.

In such an organization the safety director has a staff function. He is a planner, a coordinator, an initiator. He is the representative of the will of management. He keeps the records and compiles the statistics that play so large a role in accident prevention. But if the ultimate responsibility for safety rests with the safety director, rather than the foreman, a conflict of purpose will develop that will wreck the program.

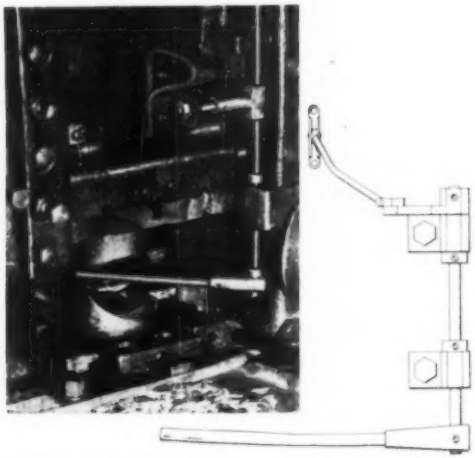
In large organizations the job of safety director is a full-time one. In smaller organizations it can be a part-time job (usually the part-time safety director also handles employee relations), but it should never be treated as an incidental job to be assigned to an overworked official.

Opinion differs widely as to the value of committees. Their success depends primarily on the way they are organized, their function, and the personality of the people who make up their membership. Some plants have found safety committees invaluable, others have found them complete failures.

Large plants may have multiple committees—one at the top to formulate policies and others to put these policies into effect. Membership on committees should include safety and medical representatives and operating officials. They may include one or more workers.

Including too many workers on a committee, unless they are carefully chosen, may turn meetings into gripe sessions that prevent constructive action. The committee must appreciate that because nearly all accidents result from *unsafe acts*, this phase must be its primary concern.

When a plant has a committee of production executives or supervisors, this committee can frequently serve as safety committee with the safety director joining the committee. In this way, as it should be, safety is considered an integral part of production.



Press guard developed at Yale & Towne sweeps forward between dies as ram descends. Original version (left) swung guard forward by cam on press ram, returned it by spring (not shown). Revised version (right) has lever connection to ram eliminating slow return from weak springs. Guard itself is a hardwood dowel

First Steps

IN SETTING up or revising a safety organization, the first step is to decide on the basic organization and establish lines of authority. An analysis of accident records for the past two or three years should be made to determine the most dangerous points.

There should be a meeting of operating executives to inform them of the new program, emphasize the backing management is giving the program, and to give them an opportunity to meet the safety director. At this time results of the analysis of accident records can be reported, experience of other companies cited, and plans discussed. Operating executives should clearly understand that they will be held responsible for the accident records of their departments.

Foremen should be asked to prepare reports describing conditions in their departments and listing danger points. The safety director should help in the preparation of these reports (but he should not prepare them), making a complete plant inspection. From these reports a program of mechanical guarding is developed, with first attention to worst conditions. Many of the proposals can be carried out by individual foremen. This part of the program will eliminate many hazards that might cause accidents. It will also impress workers with the sincerity of management, which is essential in carrying out the later phases of the program.

First aid facilities must be provided, suitable to the needs of the plant. Present facilities should be reviewed and enlarged, if necessary.

At this point a general announcement of the new program can be made to the workers. This should explain that most accidents result from unsafe conditions or unsafe acts, that the company is doing everything it can to eliminate unsafe conditions, and that workers will be expected to do everything they can to eliminate unsafe acts.

Accident Records

IT IS naturally desirable to hold record keeping to a minimum. It is possible to become so immersed in records that there is no time for constructive activity. Always remember that the records are not an end in themselves, but a means to an end—the reduction of accidents.

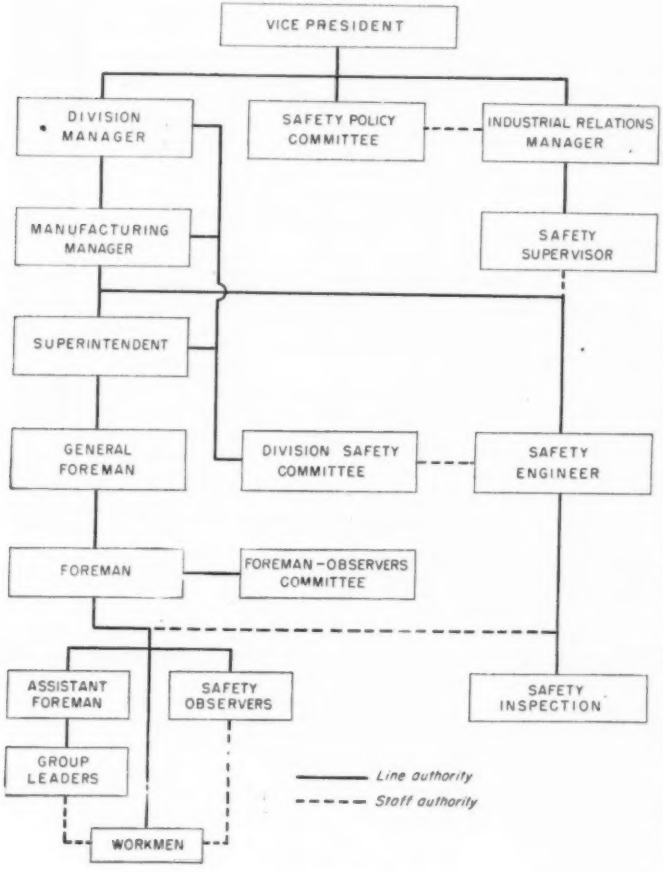
However, certain records are necessary for legal reasons relating to compensation and for the highly important purposes of locating causes, measuring progress, and stimulating interest.

The basic record is a report of individual accidents. This normally originates at the dispensary when treatment is given. Typically it is 3x5 in., or a little larger. It should include name, department, foreman, date, time, nature of sickness or injury, causes and extent of injury; it will frequently include treatment given and probable disability. This record typically is made in one to three copies.

When the dispensary visit is a result of injury rather than sickness, a copy should go to the safety director. On all but trifling injuries a copy should go to the superintendent or foreman for his comment and report of action to prevent a recurrence.

When an accident is serious, potentially serious, or unusual, a detailed investigation should be made. This generally requires a large form. In many states, lost-time accidents must be reported to the state labor department on a specified form. In most cases it is desirable to have a company form in addition

SAFETY ORGANIZATION IN A LARGE PLANT



How the safety organization operates at the East Pittsburgh Works of Westinghouse Electric Corp. There are seven operating divisions headed by a vice president. Safety is the responsibility of the foreman.

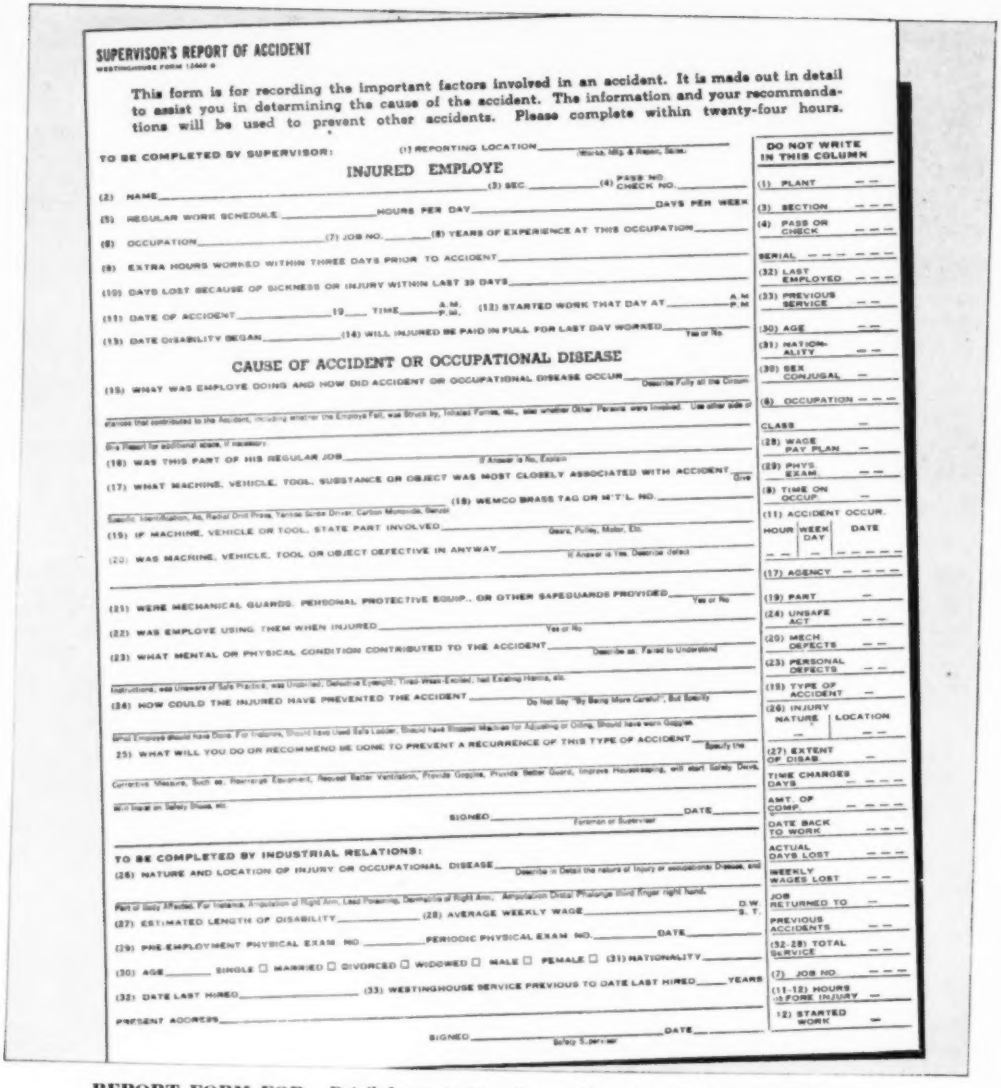
The safety policy committee is made up of the industrial relations manager as chairman, safety supervisor as secretary, medical director, director of quality control, and one representative of each division. In each case this is the highest operating official with an understanding of safety problems. Depending on size and nature of the division, it may be the division manager, manufacturing manager, or superintendent.

Divisional safety committees put into effect the policies established by the safety policy committee. Representative of the division on the policy committee is chairman and the division safety engineer is secretary. Other members include department heads, staff supervisors, and staff engineers.

The safety supervisor coordinates activities of divisional safety organizations, compiles safety statistics, maintains relations with agencies outside the company, and compiles rule booklets.

The divisional safety engineers work under their division heads. They recommend or design safeguards, instruct new employees in safe practices, investigate accidents, and make sure that personal protective equipment is available and used. One or more safety inspectors in each division assist the safety engineer.

Safety observers, appointed by foremen, are hourly rated employees. They counsel workers to correct unsafe habits and discuss unsafe conditions with foremen when they arise.



SUPERVISOR'S REPORT OF ACCIDENT

WESTINGHOUSE FORM 12460 D

This form is for recording the important factors involved in an accident. It is made out in detail to assist you in determining the cause of the accident. The information and your recommendations will be used to prevent other accidents. Please complete within twenty-four hours.

TO BE COMPLETED BY SUPERVISOR: (1) REPORTING LOCATION (Works, Mfg. & Repair, Sales)

INJURED EMPLOYE

(2) NAME (3) SEC (4) PASS NO. CHECK NO.

(5) REGULAR WORK SCHEDULE HOURS PER DAY DAYS PER WEEK

(6) OCCUPATION (7) JOB NO. (8) YEARS OF EXPERIENCE AT THIS OCCUPATION

(9) EXTRA HOURS WORKED WITHIN THREE DAYS PRIOR TO ACCIDENT

(10) DAYS LOST BECAUSE OF SICKNESS OR INJURY WITHIN LAST 30 DAYS

(11) DATE OF ACCIDENT 19 TIME A.M. P.M. (12) STARTED WORK THAT DAY AT A.M. P.M.

(13) DATE DISABILITY BEGAN (14) WILL INJURED BE PAID IN FULL FOR LAST DAY WORKED Yes or No

CAUSE OF ACCIDENT OR OCCUPATIONAL DISEASE

(15) WHAT WAS EMPLOYE DOING AND HOW DID ACCIDENT OR OCCUPATIONAL DISEASE OCCUR (Describe Fully all the Circumstances that contributed to the Accident, including whether the Employe Fell, was Struck by, Inhaled Fumes, etc., also whether Other Persons were Involved. Use other side or a Report for additional space, if necessary)

(16) WAS THIS PART OF HIS REGULAR JOB If Answer is No, Explain

(17) WHAT MACHINE, VEHICLE, TOOL, SUBSTANCE OR OBJECT WAS MOST CLOSELY ASSOCIATED WITH ACCIDENT Give Specific Identification, As, Radial Drill Press, Yankee Screw Driver, Carbon Monoxide, Benzol

(18) WEMCO BRASS TAG OR M'F'L. NO.

(19) IF MACHINE, VEHICLE OR TOOL, STATE PART INVOLVED (Gears, Pulley, Motor, Etc.)

(20) WAS MACHINE, VEHICLE, TOOL OR OBJECT DEFECTIVE IN ANYWAY If Answer is Yes, Describe Defect

(21) WERE MECHANICAL GUARDS, PERSONAL PROTECTIVE EQUIP., OR OTHER SAFEGUARDS PROVIDED Yes or No

(22) WAS EMPLOYE USING THEM WHEN INJURED Yes or No

(23) WHAT MENTAL OR PHYSICAL CONDITION CONTRIBUTED TO THE ACCIDENT Describe as, Failed to Understand Instructions, was Unaware of Safe Practice, was Unskilled, Defective Eyesight, Tired, Was Excited, had Existing Harms, etc.

(24) HOW COULD THE INJURED HAVE PREVENTED THE ACCIDENT (Do Not Say "By Being More Careful", But Specify What Employe Should Have Done. For Instance, Should Have Used Safe Ladder, Should have Stopped Machine for Adjusting or Oiling, Should have worn Goggles.

25) WHAT WILL YOU DO OR RECOMMEND BE DONE TO PREVENT A RECURRENCE OF THIS TYPE OF ACCIDENT Specify the Corrective Measure, Such as, Fluorescent Equipment, Repaired Boiler Ventilation, Provide Goggles, Provide Better Guard, Improve Housekeeping, will start Safety Dance, Will Have an Safety Shows, etc.

SIGNED (Foreman or Supervisor) DATE

TO BE COMPLETED BY INDUSTRIAL RELATIONS:

(26) NATURE AND LOCATION OF INJURY OR OCCUPATIONAL DISEASE (Describe in Detail the nature of Injury or occupational Disease, and Part or Body Affected, For Instance, Amputation of Right Arm, Lead Poisoning, Dermatitis of Right Arm, Amputation Distal Phalange Third Finger right hand.

(27) ESTIMATED LENGTH OF DISABILITY (28) AVERAGE WEEKLY WAGE D.W. S.T.

(29) PRE-EMPLOYMENT PHYSICAL EXAM NO PERIODIC PHYSICAL EXAM NO. DATE

(30) AGE SINGLE ☐ MARRIED ☐ DIVORCED ☐ WIDOWED ☐ MALE ☐ FEMALE ☐ (31) NATIONALITY

(32) DATE LAST HIRED (33) WESTINGHOUSE SERVICE PREVIOUS TO DATE LAST HIRED YEARS

PRESENT ADDRESS

SIGNED (Safety Supervisor) DATE

DO NOT WRITE IN THIS COLUMN

(1) PLANT
(3) SECTION
(4) PASS OR CHECK
SERIAL
(32) LAST EMPLOYED
(33) PREVIOUS SERVICE
(30) AGE
(31) NATIONALITY
(30) SEX CONJUGAL
(6) OCCUPATION
CLASS
(28) WAGE PAY PLAN
(29) PHYS. EXAM.
(9) TIME ON OCCUP.
(11) ACCIDENT OCCUR. HOUR | WEEK DAY | DATE
(17) AGENCY
(19) PART
(24) UNSAFE ACT
(20) MECH. DEFECTS
(23) PERSONAL DEFECTS
(18) TYPE OF ACCIDENT
(26) INJURY NATURE | LOCATION
(27) EXTENT OF DISAB.
TIME CHARGES DAYS
AMT. OF COMP.
DATE BACK TO WORK
ACTUAL DAYS LOST
WEEKLY WAGES LOST
JOB RETURNED TO
PREVIOUS ACCIDENTS
(32-28) TOTAL SERVICE
(7) JOB NO.
(11-12) HOURS BEFORE INJURY
12) STARTED WORK

REPORT FORM FOR SERIOUS ACCIDENTS **Detailed report** of lost-time accidents is made on a form such as this. To fill this out, supervisor must make detailed study of accident's cause and preventive measures to prevent repetition

to record the results of an accident investigation.

Such duplication is desirable because the state will be primarily concerned with data affecting compensation, while the company will be primarily concerned with data and subsequent action to prevent a recurrence.

All accidents should be investigated and cumulative records kept showing date, department, nature of injury, cause analysis, and days lost. It is important that such records not be limited to serious accidents. The difference between a minor accident and a fatality is often mere chance. Only by investigating and keeping tabs on *all* accidents can a safety director be sure that he is getting after the causes of potentially serious accidents.

There is a standard* for compiling accident statistics. It is desirable to follow this standard because

* Method of Compiling Industrial Injury Rates. American Standards Association No. Z16.1-1945.

it permits comparison with national and industry averages. Some states require statistics to be submitted on a somewhat different basis. In such case, most companies compile the statistics by both methods.

The method of comparison of accident records is through frequency and severity rates. These rates are based only on lost-time accidents. In a large plant it is customary to compute rates for each department. In this way the rates can be used to stimulate safety competition.

The frequency rate is the number of disabling injuries (lost-time cases) per million manhours.

$$\text{Frequency rate} = \frac{\text{No. of disabling injuries} \times 1{,}000{,}000}{\text{Total manhours worked}}$$

This basic rate eliminates, in making comparisons, the variations in number of employees and differences in working time.

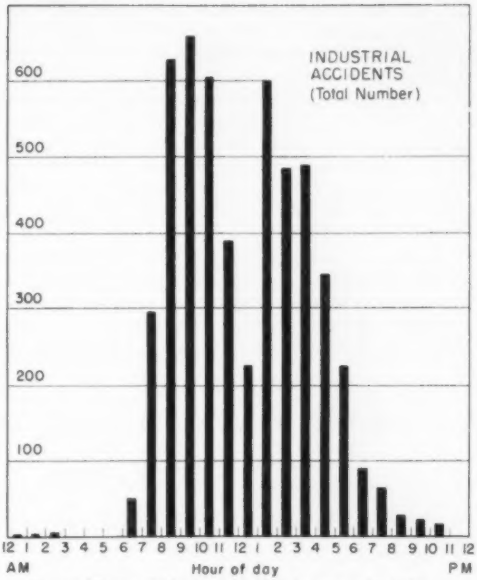
The severity rate is based on the number of days of disability for the accidents covered in the frequency rate. It represents the days lost per thousand manhours worked

$$\text{Severity rate} = \frac{\text{Total time charges} \times 1{,}000}{\text{Total number of manhours worked}}$$

In making this calculation, a charge of 6,000 days is made for each death or permanent total disability. Lesser charges (from 75 to 4500 days) are made for permanent partial disability according to a detailed schedule established in the standard. Temporary disability is charged for the actual number of days away from work in excess of 24 hours (including non-work days such as Saturdays, Sundays, and holidays).

In most cases frequency and severity rates are computed monthly. In this way progress of the safety program can be charted regularly. The rates and other summary data, such as breakdowns by cause and type of industry, should be sent to management and to supervisors.

In plants where the degree of danger varies widely between departments and direct competition would be misleading, it may be preferable to have each department compete on the basis of its own record. For example each department could be listed with its own frequency and severity rate and its own five-year average of these rates. The department with the greatest percentage drop from its average would then be the winning department for the month.



Time-of-day accidents occurred in one plant for one year indicates peaks in the morning and immediately after lunch. This seems to refute traditional view that most accidents occur when workers are tired. It may indicate that at peak hours workers are still not concentrating fully on job but letting attention wander to other affairs

Accident Case No. _____

Name _____ Reg. No. _____

Treated By _____ Foreman _____

Date of Accident _____ Hr. _____ Date 1st. Treat. _____

History (Employee's Claim) _____

Diagnosis or Impression _____

X-Ray _____ Left Work _____

Ret'd. Work _____

BROWN & SHARPE MFG. CO.

Initial report of accident prepared by the dispensary will follow a form similar to this. Frequently space for comment of foreman is provided on back of card

Inspections

WHEN foremen are responsible for safety, they are likely to make a continuing inspection of their departments for unsafe conditions and for workers who behave in an unsafe manner. Even so it is advisable to have periodic inspections by a man from outside the department who will have a fresh approach and may discover hazards the foreman has overlooked.

If the plant is small enough, it may be possible for the safety director to make these inspections, handling the departments on a rotating schedule. Larger plants should have one or more full-time safety inspectors for this purpose. These men can develop guards and other safeguards for hazardous conditions and take care of having them made and installed.

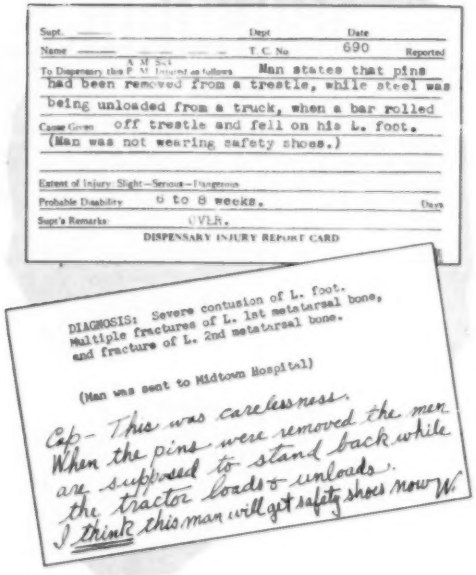
One method that has worked well is to have each foreman inspect some other department every six months. Many valuable ideas are interchanged in this way and many overlooked hazards are discovered.

Another method is to have one or more workers

in each department on each shift designated as "safety observers." Such men wear a distinctive emblem. Their primary function is to detect unsafe acts by other workers and to caution them. Often a worker is in a better position to do this than a supervisor. If the men for these jobs are carefully chosen and indoctrinated, the method will work well. Of course, safety observers should also call the attention of foremen to any unsafe conditions (and when this happens *immediate action* should be taken to correct the condition).

In general, however, a safety program should not reach the stage of worker participation until management has demonstrated its own sincerity by finding and correcting virtually all unsafe conditions in the plant. For this reason, the safety observers serve principally in the work of making other workers safety conscious.

PROOF OF PROTECTION



Supt. _____ Dept. _____ Date _____

Name _____ T. C. No. 690 Reported _____

To Dispensary the F. M. reported as follows: Man states that pins had been removed from a trestle, while steel was being unloaded from a truck, when a bar rolled off trestle and fell on his L. foot.

Cause Given: (Man was not wearing safety shoes.)

Extent of Injury: Slight—Serious—Dangerous

Probable Disability: 6 to 8 weeks. Days

Supt's Remarks: OVER.

DISPENSARY INJURY REPORT CARD

DIAGNOSIS: Severe contusion of L. foot. Multiple fractures of L. 1st metatarsal bone, and fracture of L. 2nd metatarsal bone.

(Man was sent to Midtown Hospital)

Cap- This was carelessness. When the pins were removed the men are supposed to stand back while the tractor loads & unloads. I think this man will get safety shoes now W

Safety Pays: An 1100-lb ingot at about 1850 F fell on the side of the safety shoe, right. The shoe was ruined, the foot was not. The man was back at work in 20 minutes. By contrast, the accident report above shows what happened in the same plant to another man when a 300-lb bar (cold) fell on his left foot

Instruction

MANY accidents are caused by careless or inadequate instruction. No worker should undertake a new job without an understanding of the hazards involved and the safety measures to be taken. This instruction should be given by the foreman or other suitable person in authority. It should not be a case of, "Hey, Joe, show this man how to run this machine."

At A. C. Gilbert a thorough method of checking this training has been developed. A card record is kept in the safety office for each employee that shows what machines he is authorized to operate. If a foreman wishes to put a worker on a different machine, he gives the necessary instruction and notifies the safety office. The safety director quizzes the employee informally the first day on the job.

If the worker misses an important safety point, the safety director explains it to the worker, then tells the foreman to put more emphasis on that point next time. The new qualification is then entered in the employee's record.

Protective Equipment

THE importance of protective equipment to safety is generally recognized. A wide variety of types is available to meet virtually every requirement (see Modern Industrial Safety Equipment; AM—Oct 7 '48 p 101). Selection of suitable equipment is a technical problem. An administrative problem of equal importance is the matter of getting workers to wear equipment consistently.

Usually protective clothing required for hazardous work is furnished to the worker and usually there is not much difficulty in getting the men to wear this equipment. This is unfortunately not the case with safety shoes and safety glasses.

Experience has shown that most industrial accidents involve injury to eyes, hands, legs, and feet. Even when there is not a specific hazard the average worker is much safer with eye and foot protection.

Normally the worker must buy safety shoes at his own expense. Some firms pay part of the cost or supply the first pair. Some firms provide shoes for the most hazardous jobs. More common practice is for the company to operate a shoe store and sell shoes at cost. If, as sometimes happens, the cost of operating the store is borne by the company, the shoes are actually being sold below cost.

Company shoe stores are not limited to large firms. A small concern can maintain a small stock in the dispensary with the nurse handling fittings.

If a few of the more-attractive safety shoes are available (at a cost to the worker less than conventional shoes) and this is properly publicized in the plant, it is a strong inducement to protect the feet without having to be concerned about after-hours appearances of the shoes. The rest is a matter of education.

Posters can emphasize the value of safety shoes. One good method is to show pictures of popular employees with statements about how they wear safety shoes and why. If there is a feeling that safety shoes are "sissy," such testimonials will help break it down.

Publicity can be given to foot injuries which would have been avoided by safety shoes. Foremen and safety director can make direct appeals to men.

By consistent efforts, many plants have made safety shoes standard dress for both workers and supervisors.

Eye protection is one of the most important and one of the hardest to achieve features of a good safety program. The problem is largely psychological. Everyone who wears conventional glasses knows that after a period of time he is scarcely aware that he is wearing glasses and he certainly finds them no inconvenience.

Properly fitted safety glasses can be just the same. This does not apply to goggles, which will always cause some discomfort in prolonged wear, especially in hot or humid atmospheres. It is desirable, therefore, not to place the emphasis on the word "goggles."

In deciding what safety equipment to specify for a given job, safety glasses should be chosen wherever it is safe to do so. If goggles are restricted to the hazards that require them, such as grinding and chipping, there is a better chance of success.

Men who need correction to see properly should have prescription-ground safety glasses unless the job requires goggles. This is far preferable to wearing two pairs of glasses or a cover goggle. Most plants supply prescription-ground safety glasses in standard frames to workers who need them. Normally the worker supplies the prescription (which should be checked by the company) and the company has an optometrist order and fit the glasses. In some cases, plants have had an optometrist come into the plant and prescribe glasses.

Equal care should be devoted to fitting glasses for workers who do not require prescription glasses. These will be the people who will be difficult to train to wear glasses consistently and so good fit is essential.

The most successful firms generally have definite regulations about wearing safety glasses with stated penalties for violation. For example, a warning the first time, three days off for the second offense, leading up to dismissal for habitual violators. Such companies have a clause in their union contracts stating that the union will support disciplinary action for violation of plant safety regulations.

We have found no instance in which such action has actually been taken. The threat of it seems to have been enough.

Providing equipment for cleaning glasses and goggles at stations scattered through the plant is effective.

Continuous education should accompany the regulations, and may be successful without them. Posters and other means can be used, but the personal

SAFETY INSPECTION CALENDAR

DAILY

1. Automobiles
   - A. Passenger
   - B. Trucks
2. Construction work
3. Cranes by operators (See Monthly, item 1)
4. Dip tanks by operators
5. Electric signs
6. Eye protection
7. Fire fighting equipment
8. Floors and aisles
9. Foot protection
10. Gas masks
11. Guards—equipment
12. Piling and stacking of material
13. Railway equipment
14. Respirators—wearing of
15. Sanitation
16. Scaffolds—temporary
17. Walks and driveways
18. Wiremen's spurs—in use
19. Wiremen's rubber gloves —tested when in use.
20. Yards
21. Industrial elec. trucks

WEEKLY

1. Bulletin boards
2. Drinking fountains
3. Ladders—portable (See Monthly, item 20)
4. Portable hand tools
   - A. Elec. and air drills
   - B. Electric wood saws
   - C. Air hammers
   - D. Grinders
5. Spray booths
6. Stretcher cabinets
7. Trip by shop regulations committee

MONTHLY

1. Cranes by inspectors (See Daily, item 3)
2. Crane runways
3. Crane trolley wires
4. Conveyors
5. Dumbwaiters
6. Elevators
7. Electric pots
8. Enameling towers
9. Extension cords—elec.
10. Flood gates
11. Flood pumps
12. Furnaces
13. Grinders—tool
14. Hand tools
15. Hoisting apparatus
    - A. Special lifting devices
    - B. Chain blocks
    - C. Electric hoists
    - D. Air hoists
    - E. Slings
      - (1) Chain
      - (2) Wire rope
      - (3) Manila rope
16. Industrial heating and ventilating
17. Industrial railway
18. Jibs
19. Kitchen equipment
20. Ladders—stationary (See Weekly, item 4)
21. Ovens
22. Piping
    - A. Air
    - B. Gas
    - C. Hydraulic
    - D. Oil
    - E. Steam
    - F. Water
23. Pressure gauges
24. Pressure tanks
    - A. Air
    - B. Water
25. Punch press trips
26. Roofs
27. Safety belts and straps
28. Safety meeting
29. Saws—high speed metal
30. Switchboards
31. Thermometers
32. Trucks, hand
33. Welding outfits
    - A. Acetylene
    - B. Electric

QUARTERLY

1. Cable tunnels
2. Floor loadings
3. Gasoline tanks
4. Gasoline torches
5. Lead covered cables
6. Power transformers
7. Sewers
8. Sterlizing outfits for goggles, etc.
9. Test floors
10. Traffic lines
11. Warning signs

SEMI-ANNUALLY

1. Belt lacings
2. Bridges
3. Buildings
4. Electric switches
5. Fences
6. Fire escapes
7. Manholes
8. Outdoor power lines
9. Outdoor substations
10. Overhead walks, and platforms
11. Pole lines
12. Safety cans
13. Stacks
14. Stair treads, railings
15. Window hooks

ANNUALLY

1. Fire drills (No notice given)

Calendar showing typical routine safety inspections in a plant of considerable size. Basically a plant of any size would use so much of this as applied to their operations

Safety-shoe store at Allis-Chalmers is located in a converted railway car—a troop car purchased from War Assets and remodeled. Normally it is located at a central location in the main plant but periodic trips are made to branch plants

contact between foreman or safety director and workers is most effective. This should be more than a curt order to don the spectacles. A friendly, personal sales talk will do more than anything else to put the program across. Once the man is sold on the idea, posters will serve as an effective reminder.

Maintaining Interest

THE basic aim of the safety program is first to make the plant a safe place to work and then to teach the men to work safely. The second part of the job is the hardest. It involves instilling and maintaining a safety consciousness on the part of the workers.

Personal contact is one of the most effective factors. Obviously the safety director in the average plant cannot maintain personal contact to sell safety to every man in the plant. Each foreman or group leader, however, can maintain that contact. Foremen can be sold by their superintendents. The superintendents can be sold by the manufacturing manager. Thus we come back to the basic point that safety must start with the president.

If the head of a plant is safety conscious, that consciousness can be made to penetrate to every man in the plant.

Safety posters are a popular means of maintaining interest. Beautifully prepared and dramatic posters are available from the National Safety Council and other sources. No poster should be left in one location. Posters should be changed once a week. A good method is to combine a safety poster, a "news" picture, and some other notice in a single display.

It is not necessary to buy posters, however. Home-made posters are often more effective, though not necessarily cheaper. Blackboards can be placed at suitable locations and effective safety messages chalked on them.

Competition and worker-participation are sure ways to build safety consciousness. Both are utilized in safety contests. A poster contest at a Westinghouse plant drew 164 entries. Prizes were given to winners selected by judges from outside the plant. Following a mass display of the posters there were additional prizes given to winners selected by popular vote (more participation) of workers. The better posters were copied and displayed in the plant. Other contests may be held for slogans or limericks. At Kaiser-Frazer a limerick contest produced 500 entries, many of which were used on safety posters.

Safety consciousness is stimulated by competition between departments. For this reason, safety statistics, and the ranking of departments, should be publicized in the plant. Blackboards or movable-letter signs are effective.

If there is a plant newspaper or magazine it can be effectively used to report safety statistics and to promote safety with right-and-wrong picture stories, reports of new plant safeguards, and other safety stories. These should be short and frequent rather than occasional long lectures.

Competion between departments can be stimulated periodically by contests with prizes for the best record over a stated period. However, the safety program itself must not be spasmodic.

Variety can be provided by changing the emphasis; it should never be provided by relaxing the pressure. One month the emphasis can be on how to avoid leg injuries, another month on wearing safety glasses, and so on through the desired cycle of subjects.

Placing the emphasis on one phase does not result in neglect of the others. Experience has shown that any improvement in one part of safety brings on improvement in the rest.

For example, at one Allis-Chalmers plant a test was made in which 250 employees wore goggles for three months and an equal number did not. Not only were there far fewer eye injuries (1 to 11) in the goggle-wearing group but other injuries in this group were reduced 67%.

Acknowledgment . . .

The ideas and suggestions for this Special Report were originated by many men in industry. Unfortunately we do not know who first thought of many of these ideas, so cannot give credit for them. Specifically, we wish to express our appreciation for the valuable assistance of the National Safety Council, the Metropolitan Life Insurance Co., and the following companies:

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Westinghouse Electric Corp.
Willson Products
Yale & Towne Mfg. Co.

58 Pointers for Design of Successful Progressive Dies

BY J. R. PACQUIN, Tool Engineer, Hartford Machine Screw Company

USE OF design procedure outlined will insure that no important part of the finished die is omitted, and that design decisions are made in proper sequence. Many "false starts" will be eliminated.

In use, design decisions are made in chronological order given, starting with 1 and following through to 58. When the last step is reached, the progressive die will have been designed in an efficient and accurate way—no matter how intricate or elaborate it may be.

Design Procedure

1. Develop the blank with dimensions in decimals.

2. Establish a tentative sequence of operations, allowing idle stations for adequate strength of sections. Consider the required part accuracy. Progressive dies cannot hold distance between holes and outside of the blank closer than 0.005 to 0.010 in., depending on size of the blank.

3. When piercing stock "in the flat" (which is to be bent later) the edge of the hole must be at least 1½ times the stock thickness from the centerline of the blending radius, Fig. 1.

4. Can frail inserts be eliminatde by punching out certain portions of the blank at one station, and blanking the rest in a later operation? Fig. 2.

5. Lay out the scrap strip, using three cardboard templets. Consider:

(a) Relation of bend to grain. It must not be less than 30° across the grain.

(b) Relation of burr side to bend. Burr must always be on the inside.

(c) Pilot interference.

(d) Half holes.

(e) Partial blanks.

(f) Location of pilot holes. Pierce these at first station.

(g) Material economy.

6. Establish the final sequence of operations.

7. Establish the blanking centers and the strip width.

8. Mark, in color, the bolster-plate opening for scrap disposal to insure scrap holes in the die are over this opening.

9. Establish the location of the punches for the pilot holes at the first station. On drawn work, drawing takes precedence and is done at the first station. Drawing depth must not exceed 3/16 in., with the diameter of the cup twice the depth, or more.

10. Pilot in the pierced holes at the second station. Decide the succeeding pilot sequence.

11. Draw the notching punches. Incorporate back-up heels. These are usually placed at the first or second station, or both.

12. Decide the method of bending. Two procedures are:

(a) Bend the ears down.

(b) Ramp the strip and form the ears up.

At the last station, when cutting off and bending simultaneously with a pressure pad, the difference in height between the cut-off punch and the bending punch must be one stock thickness. Provide a pressure pin in the bending punch to hold the stock while cutting takes place.

13. Design any forming punches. Forming is performed, usually, immediately before or after cutting off (for one form). Provide shedder pins as required.

14. Design the spanking punch, if one is necessary. It is usually placed at the station immediately preceding the last operation, for one spank. Combine with the bending or forming operation, if possible.

15. Decide if a scrap cutter is necessary, and where applied.

16. Sketch suitable method of strip location:

(a) Channel stripper.

(b) Channel and bar pusher.

(c) Channel and roller locater.

(d) Equalizing bars and rollers.

The length of actual guide before the first operation should be at least twice the stock width.

17. Sketch the die block. The minimum distance between the die-hole edges and the outside edge of the block should be from 1 to 1½ times the thickness of the block, or more, depending on the intricacy of the block opening. Establish the number of sections for easy machining, hardening and replacement. Decide the method of

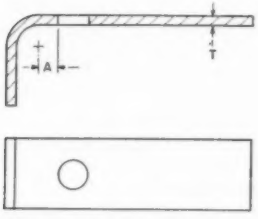


Fig. 1.. Dimension *A* must not be less than 1½*T*, when piercing stock that must later be bent to a radius

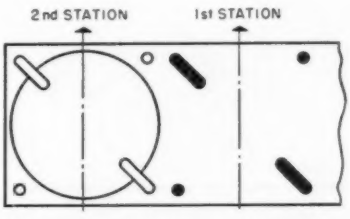


Fig. 2.. Frail inserts in the blanking punch are avoided by punching the slots and pilot holes in the first station, and blanking the part at the second station

keying and whether the key should be "set into" the die holder, or "set on top." Select the screws, (and dowels, if the die is to be set on top). If possible to assemble the die parts improperly, show one dowel off center for foolproof purposes.

18. Locate the finger stops.

19. Choose the automatic stop.

20. Incorporate inserts at weak places, if any are required.

21. Select a die-set from the manufacturer's catalogue. Use one longer than necessary to provide for possible future additions. Allow ⅝ in., minimum, between the die posts and die block for grinding clearance. Use a semi-steel die-set for average work. In severe applications, specify an all-steel die-set.

Section View:

22. Decide the grinding allowance—¼ in. normally.

23. Consider how sharpening will affect relative heights of bend and form punches. Spacer pieces may be required, Fig. 3.

24. Compute the spring sizes, and list on drawing.

Punches:

25. Where a bent lug on the part would be injured by crowding, provide a punch long enough to push the blank through the die. However, this type of punch construction should be avoided if at all possible.

26. Must punches be contained in a quill? If possible, mount all quills in individual punch plates.

27. All delicate punches must be guided in the stripper. If they come too close together, apply a tool steel block, Fig. 4.

28. Slender piercing punches, set close to a large punch, should be made shorter, by the material thickness plus 0.010 in. at least, Fig. 5. This practice avoids deflection by metal crowding to one side. Step small punches set close together. Punches used to perforate shaker tops, collanders, etc., would fall into this classification.

29. For a small punch producing a hole 30-35% deeper than its own diameter, the shank should be at least twice the hole diameter. The cutting end should be hole-size for only two stock thicknesses.

30. For angular-headed punches made of drill-rod, use a 60° included angle. This type of punch may be used only when the diameter of the hole to be pierced is at least twice the stock thickness. It should always be guided in the stripper.

31. Punches should not be longer than 3 to 4 in. over-all. Use auxiliary plates, if necessary, as shown in Fig. 6.

32. All punches used in high-grade dies should be guided in the stripper. For low-production requirements, they need not be guided if the point diameter exceeds twice the material thickness.

33. For punches too small in diameter for push-off pins, but with a hole diameter from two to three times the material thickness, rounding the punch face will prevent slugs from pulling up. If smaller, make the die-hole wall straight for twice the material thickness, at least, and reduce clearance between the punch and die.

34. The flange width of unguided blanking punches should not be less than the punch height, Fig. 7.

35. In larger piercing punches, provide holes for push-off pins, to prevent slugs from pulling up. See Fig. 8.

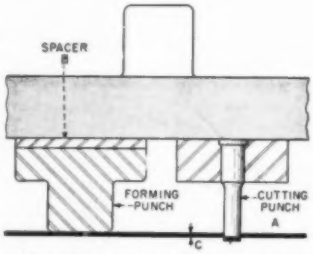


Fig. 3.. When sharpening the cutting punch *A*, the same amount is ground off spacer *B*, to maintain the relative distance *C*

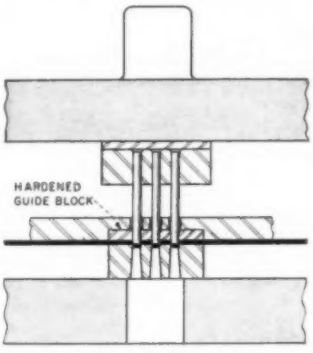


Fig. 4.. If delicate punches must be placed close together, use a hardened guide block with the required number of holes

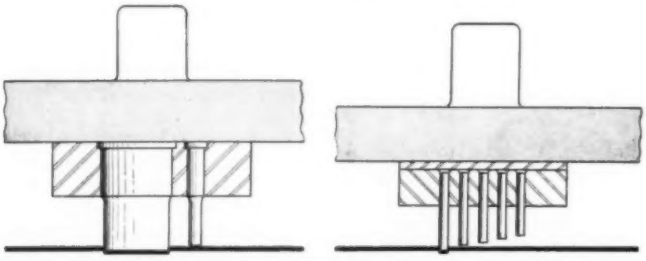


Fig. 5.. A slender piercing punch (left) is made shorter than the adjacent large punch by the material thickness plus 0.010 in. in order to avoid deflection of the smaller punch. Closely grouped small punches (right) are also stepped in the same manner

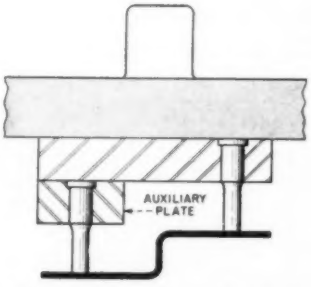


Fig. 6.. When punches must protrude more than 4 in. beyond the punch holder, use an auxiliary plate to maintain stiffness

36. Never press a hardened punch into a hardened punch plate. Use a soft plug in applications of this nature, Fig. 9.

37. In detailing make the punch body a *light* press-fit in the punch plate. It should be a slip-fit except where it actually bears in the punch plate.

38. Where other - than - round punches are needed, lock the punch by a milled flat in the punch head.

39. Long slotting punches should be made low in the center, so the ends will cut first. Leave the face flat for ⅛ in. at either end, Fig. 10.

40. Blanking punches with pilots must be set ahead of the piercing punches, so that the pilot can locate the strip before the piercing punches bind it. As in Item No. 28, a height difference of 0.010 in. should be allowed.

General Details:

41. When "shearing" punches and dies, the distance between high and low points should be from 2/3 to one thickness of stock. For piercing dies, apply shear to the punch. For blanking dies, (where the blank is saved), apply it to die.

42. Taper ream scrap holes ¼° on a side, or ½° included angle, leaving straight the first ⅛ in. from the cutting edge.

43. In piercing, when using tool steel bushings set into the die block, make all holes in the block, stripper and punch plate the same size, if possible, so they can be bored together.

44. When pressing die buttons into a hardened block, use a light press fit and "shoulder" them to prevent pulling out.

45. Use a hardened plate in back of all punches, where necessary. This applies to dies for long runs, and also for all small punch heads. Make these backing plates ¼ in. thick. On a semi-steel punch holder, use them for No. 11 ga. (0.120) or over. For steel punch holders, use them for No. 7 ga. (0.180) or over. Always use them for very small punch heads, however. Round plates, counterbored into the punch holder, will serve for single punches. Square plates, cut "to suit," can be used for multiple punches.

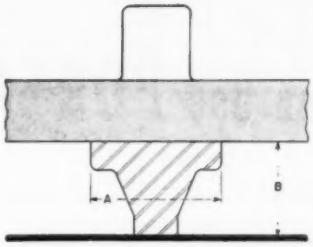


Fig. 7.. Flange width *A* of the punch should be greater than the height *B* to provide stability for unguided punches

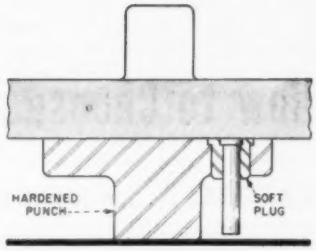


Fig. 9.. To avoid cracking a large hardened punch, or punch plate, never press a small punch directly into either of these members, but use a soft plug or insert instead

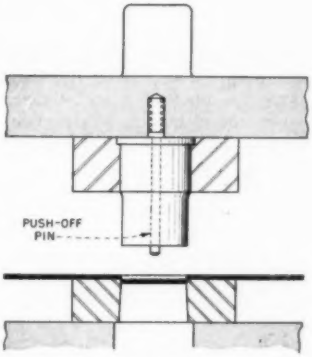


Fig. 8.. Push-off pins in large punches prevent slugs from pulling up and causing trouble

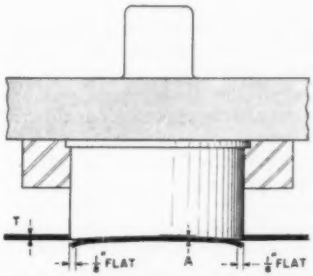


Fig. 10.. Hollow-grind long slotting punches so that dimension *A* equals the metal thickness, to put shear on the punch. However, the ends should be flat for ⅛ in. to avoid bending the stock at these locations

46. If possible the pilots should be made removable for ease in grinding punches.

47. Avoid spring pilots, if you can. However, they must be used for stock heavier than 1/16 in. thick.

48. Carry the pilot holes through the die and die-holder, and taper ream them ¼° per side to compensate for misfeeds. This is equivalent to ½° included angle.

49. Compute the required stripper-plate thickness.

50. Make the channel stripper width (inside) a minimum of 0.004 in. greater than the strip width.

51. The punch-plate thickness should not be less than 1½ times the diameter of the punch shank. The material should be tool steel, left soft, or good machine steel.

52. Punch plates and die plates must be from 1¼ to 1½ times wider than they are high, minimum, for stability.

53. Decide location of any air vent holes.

54. Bolt heads in die plates should be set ¼ or ⅜ in. below the top surface to allow for sharpening the die.

55. Tapped holes for fastening gages should be tapped ¼ or ⅜ in. deeper than necessary to allow for sharpening the die. This lowers the gages.

56. Incorporate bumper blocks, if required.

57. In the "Bill of Materials," specify steel for cutting members so they can be machined with the cutting edges at the end of the grain.

58. Furnish a jig-boring layout, set to the correct blank angle, and incorporating the proper clearances.

How to Choose and Use PORTABLE TOOLS

PART 10 . . . MANAGEMENT'S PART IN MAINTENANCE

Cooperation between management and the maintenance department can effect important savings in portable-tool operating costs

BY H. P. BAILEY, President, THE ROTOR TOOL CO.

ONCE a complete maintenance plan is installed and operating, contact and cooperation between the management and the shop affords opportunities for real savings.

First attention may be given to the problem of stocking repair parts. The company's own experience, if available, or the recommendations of the manufacturer, make it possible to determine maximum or minimum stocks of different types of parts. In many cases one part may never be purchased, while certain parts are designed to take the wear and will be replaced more frequently.

This situation is perhaps just a little beyond the average maintenance man, but once a maximum-minimum basis is set up it will be found that the total stock of parts carried can be reduced quite a bit, and with fewer difficulties experienced because necessary parts are missing.

These stocks should not be set too high from another viewpoint, because manufacturers of portable tools are continually finding opportunities to improve their product and change models, and this results in obsolete repair stocks. Another situation where cooperative effort is necessary between management and maintenance man is the question, "Does it pay to repair this machine, or should it be replaced?"

There is quite a variety of thinking on the part of factory executives themselves on this problem, and certainly the maintenance man is in no position to settle it, except along the lines of a well-defined policy. Investigation of a particular situation will first discover just how bad the machine is and what it needs to repair it. In these days of high prices, sometimes a rather modest-looking list of repair parts totals up to a surprising sum, and the labor involved raises the cost still further. Unless the job is done exactly right in the case of a major repair, the expected efficiency of the tool may not materialize.

On the other hand, experience shows that maintenance men often buy an inordinately large number of parts, and repair machines which have long since passed their prime. The purchasing agent is hardly in a position to question the repair requisitions too closely and there is undoubtedly a good deal of rather poor judgment used in the buying of unnecessary repair parts. There is also undoubtedly a desire on the part of the average maintenance man to protect himself against trouble by carrying more parts than are necessary. This is particularly wasteful because parts are available from the manufacturer or distributor practically over night in most cases.

The situation also arises where, because of the red tape involved in putting through requisitions for new tools and obtaining an appropriation, it is easier to buy an excessive amount of repair parts than to get a new tool, even though the parts may cost considerably more than the new tool.

The question of repairing an individual tool first requires an answer to how much it will cost, then it should be determined whether the tool can be brought back to original efficiency. The next question is whether or not a new tool will or will not do the job cheaper

than the old tool when repaired. If new types of tools are available, better than the original tool, this may be true, since manufacturers are continually improving their product. There is no arbitrary rule covering this question of repairs, but certainly if it costs 50% of the cost of a new tool to repair the old one, the question should be raised as to whether new tools should be purchased or the old one repaired.

Factory men, in checking the tool, seek to determine how long it will take the new tool to recover the extra cost. For example, if the new tool costs $160 and the repairs cost $80, what is the production result going to be on the new tool and how long will it take to pay for itself in increased productivity? If labor costs $2 an hr or $16 a day, and the operator uses the tool only 50% of the time, the daily labor cost chargeable to portable tools is only 50% of $16, or $8. The pressure for cost reduction is intense today, and after tools have served a reasonable life and need repairs costing 50% of a new tool, it is probably advisable to replace the tool with the new one. In some situations this may not necessarily be true and the maintenance man needs guidance in such situations.

Watch Safety Rules

Another way to get help from the maintenance man, is through the stressing of safety. The safety code outlines very carefully the maximum speeds permissible for different types of wheels, and charts of these speeds, translated into rpm for different diameters, should be posted in the maintenance room and all through the shop. These speeds should be checked periodically, checking the tool to see that it has the correct wheel in the first place, then checking the exact speed, because tools, and particularly abrasive tools, running overspeed are very dangerous.

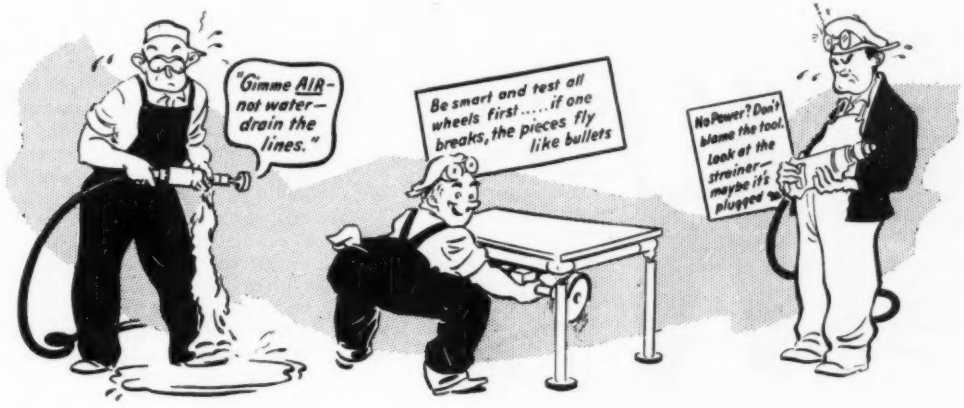
Occasionally governors overspeed through long wear and should be fixed. Wheel guards should always be used and it should be the duty of the maintenance man to replace them if tools are returned without wheel guards. Another point subject to constant check is the use of wheel washers, which should always be of the same size, and any irregular washers put on in the shop should be replaced before re-issuing the tools. Spindles should also be checked to be sure they are not bent, which will cause vibration and trouble. The repair man, when starting a machine with a wheel mounted, should always set an example to the shop by starting the tool under the bench.

Another place for cooperative effort is in constant attention to the checking of air strainers. These devices filter the air entering pneumatic devices to keep dirt and scale from entering. If dirt and scale is in the pipes the strainers naturally become plugged with dirt, lowering the air pressure, and then many times the operators themselves will impatiently punch a hole in the screen. A certain amount of periodic checking and telling of this story by the repairman will definitely help the situation. The remedy for a clogged screen is to dismantle the strainer, blow it out, and either put it back or put a new screen in. This short operation will increase the life and efficiency of the tool by keeping out dirt and restoring pressure.

Specific Instructions

In the case of chipping hammers, the repair man is called upon to exercise considerable judgment. Operators are particularly critical of the performance of chipping hammers, and low air pressure hurts this performance. In repairing chipping hammers, the repair men do not as a rule find much trouble with the modern high-speed valves used today. However, if they are anxious to return the hammer to the exact number and weight of blows, and amount of recoil which the operator likes, the maintenance of chipping hammers is a matter of some care. Usually the first point of wear is the chisel bushing. When this wears, say 0.010 in., air leaks through the front end and the chisel is often not straight when hitting a blow, which leads to trouble. Therefore, maintenance policy in chipping hammers calls for change in chisel bushings whenever they show any appreciable signs of wear.

In the case of plungers the point of replacement also calls for judg-


"Gimme AIR- not water- drain the lines."
Be smart and test all wheels first ..... if one breaks, the pieces fly like bullets
No Power? Don't blame the tool. Look at the strainer- maybe it's plugged

ment. The plunger in a new hammer tends to wear barrel shaped. Judgment is necessary to determine the point when a new standard plunger should be inserted. Possibly this process is repeated again before an oversize plunger is used. Meanwhile, it may be well to straighten the cylinder bore. The amount of metal removed by chipping hammers is peculiarly and directly tied in with the exact blow struck by the hammer, and obviously any cut in the efficiency of the hammer reflects itself directly in the cost of operation.

Sand rammers require attention to lubrication since most models now provided by the manufacturers contain an oil reservoir which affords automatic lubrication. The packing at the bottom of the tool also needs occasional simple adjustment at the point of operation. Air screens should be kept on the inlet side of the tool to keep dirt and rust out of the inside of the tool, otherwise maintenance is very similar to that required for chipping hammers.

High-Cycle Maintenance

In the case of high-cycle tools, there is a combination of mechanical and electrical maintenance. On the mechanical side, lubrication, as always, is important, and blowing out the motor ventilating openings with compressed air should be carried out regularly. Under some dusty conditions it may be necessary to do this daily, and in this case the foreman should be made responsible for this daily chore. It takes only a minute but reduces the possibility of stator damage. It is always recommended that high-cycle tools be brought into the maintenance shop, when of the abrasive type such as grinders, sanders and buffers, after every 200 hr of use. In the case of drills, nut setters and screwdrivers, which are used more intermittently, and where there is usually less dust and dirt, perhaps every 400 hr. The maintenance procedure should be started with cleaning out old grease and replacing with fresh, and should include a regular scheduled checkup of such items as spindle, pinion and gear wear, checking switches and cable for grounds, blowing out live handle, etc. The correct amount of grease to be used in specific tools should be posted right above the repair bench. If stator replacement is necessary it appears sensible to find out why, whether due to continued overload, short circuits, single phasing, damaged cable or loose electrical connections, wrong voltage or rotor rubbing against stator caused by bearing wear. If this is not done the replacement stator will also burn out rather quickly.

Considerable time can be saved on high-cycle tools by using stator pullers, using correct bushings for pressing in the new stator. It might be well to mention that old stators are not a total loss but are ordinarily returned to the manufacturer for rewinding which costs less than a new stator.

Hey, Grease Monkey! Use the correct type of oil. Special pneumatic oils lubricate tools better than ordinary machine oils
PNEUMATIC TOOL OIL
OIL

Watch the Fuses

The man in charge of electrical maintenance should be equipped with proper equipment to clear shorts which may occur in cable plugs or receptacles in the tools. There is no essential difference between maintenance on the 180- or 360-cycle tools, but particular care should be given to replacing fusetrons with the proper size. Fusetrons are time-lag fuses which may be placed in plugs or fuse boxes or in fused-type handles. They are available in capacities to suit each tool as specified by the manufacturer, and larger ones should not be used. Too many blown fuses indicate overloaded tools, wrong voltage, grounded tools, dirty switches, bad plugs or cable. Ordinary cartridge fuses are not adequate protection.

For safety reasons and for preventive maintenance the high-cycle tools are customarily furnished with a fourth wire running from the frame of the tool to the fourth hole in the receptacle, which in turn is grounded to the conduit which forms a permanent ground. Whenever the tool is in the repair shop, the three wires, and the ground wire should be checked.

Fortunately or unfortunately, portable tool maintenance can be done without too much careful supervision and attention and still keep the tools running. The important point is to get the tools back to original efficiency and maintain output, and to do this a program such as outlined in this article is necessary. It is often the case that not enough attention is given by the top factory executives to the general subject of maintenance despite the fact that considerable savings can be made and worthwhile production economies effected by a thorough, periodic emphasis on the maintenance function all the way through from the power-supply unit up to the tool.

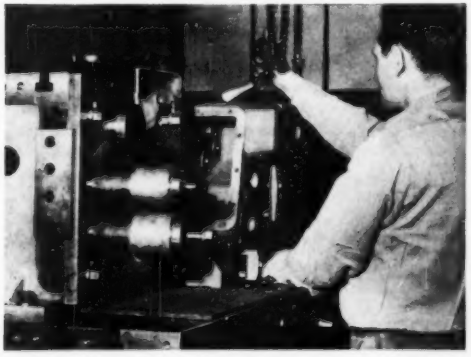
Precision Boring a Better Product at Lower Cost

BY RUPERT LE GRAND, ASSOCIATE EDITOR

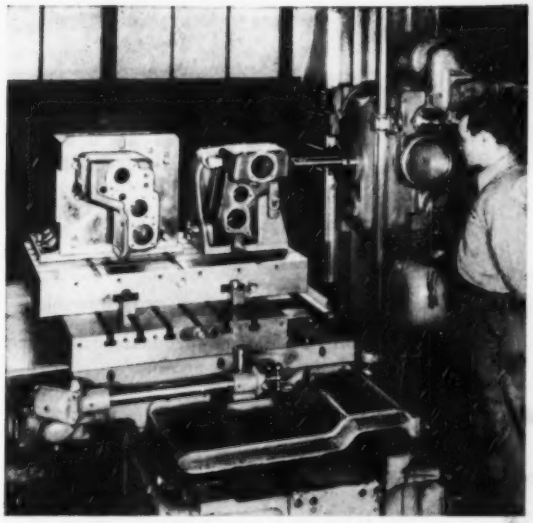
IMPORTANT manufacturing and product improvements are being realized by the Towmotor Corporation from its decision to precision-bore shaft holes in transmission cases, using a DeVlieg 3-B Jigmil for the purpose. As compared to the previous method, the time savings range up to 40%, the tooling cost for handling about a dozen transmissions cases is many thousands less than otherwise, the floorspace devoted to the work is that required for a single machine, and fixture changes are quickly made. Product changes are not restricted by tool-amortization problems.

At the time the boring machine was installed, certain additional benefits were probably unsuspected. First of all, about one-third of the former assembly time is saved. The reason for this stems back to the accuracy of hole diameter achieved (0.0003 in.) and the spacing (0.0006 in.). As a consequence, drive elements slip readily into place in the transmission case, no fitting is required to obtain the proper action. In fact, with everything else "on the nose," it was found necessary to ask gear vendors to improve the quality of their product.

While the foregoing improvements reduce manufacturing costs for Towmotor, the fact that it is able to supply a quieter-running, longer-wearing transmission on its industrial haulage equipment is an important sales advantage. Such equipment gets hard usage under all sorts of conditions. The better it stands up, the better Towmotor's chance to get an increasing share in a competitive market.



Location of the piece for the first operation (right-hand fixture) is secured by a pilot entering the main transmission shaft hole bored in the previous setup



Alignment of shaft holes is not affected by the fact that opposite faces of the transmission case are bored in separate setups. And the table is accurately indexed

How Transmission Cases Are Bored

Before reaching the Jigmil, various surfaces on the transmission case are milled and the main shaft hole is bored. Two fixtures are placed on a sub-table on the machine. The right-hand fixture first receives the piece, which is located by a pilot entering the main-shaft hole, and a vertical face positioned against buttons in the fixture. A cross-hole is bored at right angles to the main-shaft hole, and then the saddle is indexed 90° to permit boring two holes in one side of the casting.

Next, the part is transferred to the left-hand fixture for boring shaft holes opposite to those just finished. This can be done with excellent alignment, because the saddle can be indexed 180° repeatedly and color removed from the holes without taking metal. Hence it is unnecessary to line bore the holes. In this setup, the piece is located by pilots engaging the main-shaft hole and the two holes previously bored.

A highly skilled operator is not required, because settings of the saddle and spindle head to 0.0001 in. are obtained by electric sequencing controls and spacing bars. These bars are provided for saddle and head movements and are fitted with pins at accurate locations. Both saddle and head are equipped with precision limit switches with a button to contact the pins. Thus, the machine establishes the rectangular coordinates of the holes; the operator need merely change tools and progress from one position on the spacing bars to the next, according to a plan provided by the process engineers.

NO SMOKING!

Let 'em smoke on the job unless cleanliness or safety hazards interfere. Washroom smoking costs industry millions of productive manhours

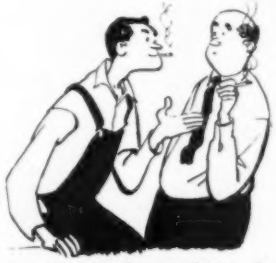
BY A. M. ELLIOTT

AMERICAN industry, as a whole, is much given to pride in its efficiency, and it must be conceded that it has no peer in the manner of meeting and solving production problems. In view of this, it is difficult to understand the attitude it takes on the question of smoking in the plant.

A questionnaire survey recently conducted among representative manufacturers in the United States and Canada, including machine tool, automobile, foods, pharmaceuticals, agricultural implements, clothing, and ceramic makers, reveals some amazing situations. Forty percent indicated only partial satisfaction with their solution of the problem, 10% were not satisfied at all, and 10% ignored the question altogether. It is difficult to understand the apparent apathy of many companies whose payrolls range from a few hundred to 150,000 employees, in that they admit to being only partially satisfied with a situation that is costing them, conservatively, ½ manhour per day for each male, and slightly more for each female employed.

It is interesting to note that, with two exceptions, all companies indicating 100% satisfaction with their smoking setup permit smoking at all times and places, except, of course, in hazardous areas. Of the exceptions, one says "No Smoking," and means it, and is actually doing what most others like to think they do, but succeed in only a limited degree. In a plant employing over 1800 men and women, "No Smoking" and "No Loafing" are not conspicuously enforced, yet the absence of both is striking. At times when most employees of other firms are jumping the wash-up gun amid a blue haze of stolen smokes, their washrooms are clear and vacant. The method of pay—hourly—for all below supervisory rank, relieves the suggested sugar-coated big stick of incentive or piecework, and not only are the company's products well known for quality and precision, but there is nearly always a waiting list of job seekers, even in times of most severe labor scarcity.

In the other exception indicating 100% satisfaction with its "No Smoking" policy, management is apparently unaware of the actual conditions. A walk through its washrooms in a mid-work period reveals a hoard of sitting and standing smokers who make it appear like the anteroom of a maternity ward. It is, therefore, hardly conceivable that the company can be 100% satisfied with a situation that is costing somewhere between 420 and 835 manhours daily for the male help alone.



"There is a peculiar similarity about washhouse meetings . . ."

To qualify the seemingly astronomical figures estimated for this lost time, let's take a further look at the picture. Many incentive standards are set up on a basis of a 15-20% "personal" allowance. This means that in an 8-hr. day, 72 to 96 min are allowed the worker for rest and personal "comfort." Now it is recognized that no human being is going to be in there slugging away 100% of his 8-hr stint. There are times during the day when everyone must let up and get away for natural relief, a drink of water, a stretch of the legs, even if, as has been figured in the percentage allowance, there is a 10-min rest period in both morning and afternoon.

Basically these other rests resolve themselves into a visit to the washroom. Finding all cubicles occupied, as they usually are in non-smoking plants, the worker props himself up against the wall, lights a cigarette, pipe, or even a cigar and joins the boys around in a chat. There is a peculiar similarity about washhouse meetings; they are infectious and can last longer than one realizes. There is always one character more vociferous than the rest, who has a great deal to say about everything and anything, usually so radical or fantastic that sooner or later during his harangue, one of the others, who came probably for legitimate

reasons or just a few puffs, feels obliged to get in there and pitch—"After all, this guy *is* nuts!" The gathering need not always have the same personnel.

As there are 16 half-hour periods in an 8-hr day and surveys have shown that many men take that number of rests—purely for a few "drags," it matters not that the relaxing smoke took about a third of this time—the whole ten are written off as lost—and ten times sixteen are 160 min. = 2 hr. 40 min.

Before the reader says "Impossible!", let him check his memory for the days when he worked in a non-smoking shop, whether he himself smoked or not, or go out and check the figures for the daily task if the workers are not on incentive and, if they are, remember a balanced standard allows 133% performance. Few men care about money enough to bang away for 133 all day but would rather hit 107-120 performance and be able to relax. Countless conversations and observations have shown that when smoking is permitted on the job, after the novelty wears off, men often light up, take a few drags, and keep the wheels turning. In some cases they lay their smoke down on the bed of the machine where it is forgotten and goes out, the smoker satisfied and no time lost. There are cases too, surprisingly numerous, considering the jaundiced eye with which management often views labor's reported efforts, where men have had a big job in a machine and not only left it running but have stayed right by it working through the rest period simply because, being able to smoke when they wanted, there was no reason to "observe" that particular time.

Even though employee discipline is entirely a matter for the individual company, yet an outsider can hardly feel there is anything laudable in an affirmative answer in the "partial" section to questions that read:

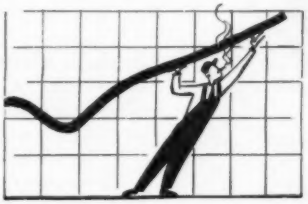
"Infringements are punishable by:

1st offense,
2nd offense,
3rd offense,

These are strictly enforced
These are partially enforced"

There are other unsavory angles to this smoking problem, as far as personnel relations are concerned. In plants where smoking is permitted in office territory but not in the plant, it is particularly griping to the men on the job to see their foremen ducking into the offices several times a day and hardly getting the door closed behind them before they light up. While it is realized this is a supervisory matter and has, perhaps, only a little to do with the smoking problem as such, it points up an undesirable condition that may be eliminated by a change in the company's overall smoking policy.

An interesting fact brought to



". . . no report has ever been noted of reduced production . . ."

light by the survey and discussions with plant management, is the growing change in attitude toward women office employees smoking at their desks. While the number permitting this practice is still low —20%, the men who expressed a desire to see this change instituted exceeded that considerably. For the most part, of course, the old answers are still prevalent, ranging from those who state they just hate to see a woman smoke, especially in public, or complain that women are such sloppy smokers, to a contention that while two or three cigarettes in an ashtray can sit on a man's desk all day unnoticed, let there be lipstick on them and they seem to make the whole place a mess.

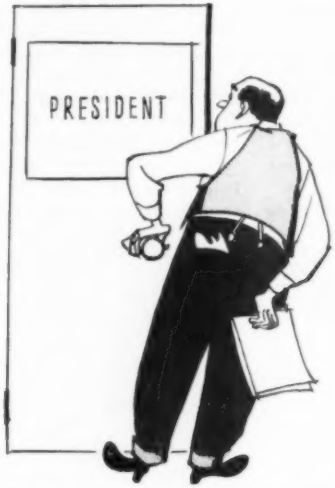
Among those who commented on recent trials of such smoking concessions and their failures, were two executives who claimed women either seemed unable to combine work and smoking, and ceased the one to sit back and thoroughly enjoy the other, usually in so complete a fashion as to belie their presence in an office at all, or they worked away, cigarette dangling from the corner of their mouths, a picture too horrible to contemplate.

There is a feeling, strengthened as time passes and bolstered further by this recent survey, tha. men are going to smoke regardless; rules, incentives or not, and are bound to waste time getting to a hideout and gabbing while there. As far as was ascertained, no insurance company charges a premium where smoking is permitted and restricted areas in smoking-on-the-job plants are strictly observed. Such areas are usually policed by the men themselves, and few, if any, industrial fires are started by openly smoking.

Most factories that could use an excuse of food contamination or hazardous inflammable processing are in all probability restricted by state laws governing such operations. They usually provide smoking areas near to the work stations with no limits on frequency or period of use, because they have come to realize that where smoking is permitted at or near the work place, anytime, less smoking is done and more important, less loafing. While an increase in production has not always been noted, particularly in the early stages of permitting smoking on the job, no report has ever been noted of reduced production. In a few cases the men considered the newly given privilege to be a come-on for increased production and have refused to rise for what they felt was proffered bait, having long before set their own daily task and abided by it. Probably because of a twisted psychology, which at the root is nothing more nor less than poor company personnel relations, they refuse to exceed this quota for anything less than a pay increase. In plants where these conditions exist, such an attitude induces a strong antipathy towards the granting of this privilege, or any other.

Fundamentally, therefore, it can truthfully be said that the answer to a question of "To Smoke or Not To Smoke" should be a strong affirmative, modified, if at all, only by the exigencies to be expected of good fire protection and production contamination safeguards.

ROUND TABLE



Planning Commission

"Ed, what's the big idea—hopping around from machine to machine and playing with them like a kid?"

"I'm not playing around, Al. I'm checking this feedwheel to find out how much play there is in it. I'm doing a little research work myself to satisfy my own curiosity."

"And just what is the result of all this research work going to amount to? I've had my eye on you for the past half-hour, Ed, and I've never seen you display such ambition."

"All right, Al. Here's my idea and I think it is a good one to be brought before the planning commission."

"Planning commission! What planning commission?"

"Maybe we haven't got a planning commission in this plant, Al, but we should have."

"Well, if it doesn't beat the old Harry, the screwy ideas you try to get away with! All right, let's assume we have a planning commission; then what?"

"Well, Al, I have found six lathes that can't be expected to turn out the best work in the condition they are in; they have served their time as real producers and certainly could be replaced now that machines are available."

"Very fine, but did your mother ever tell you that new machines cost money?"

"No need for sarcasm, Al—I'm serious about this. In days past, not so long ago either, obsolete equipment wasn't so unusual. But now, when the hourly rate has risen as it has, it is a losing proposition to keep equipment that doesn't earn its floor space."

"So you think this mythical planning commission would listen to your story if it is organized, do you?"

"If they don't, there's a screw loose somewhere and it's not in this department."

"I don't know about that! All right, Ed, I follow you smoothly up to the point of presenting your idea to the proper heads. What're you going to do: write up the idea in a letter or are you going to take it up at the next general meeting?"

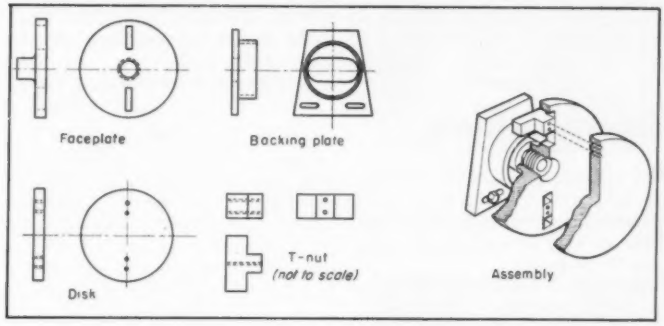
"Neither, Al; I'm going right down to the Big Boss in a few minutes to make him see where he is losing money hand over fist."

"I'd like to be a mouse when he throws you out through the glass door."

"He won't," smiled Ed, as he manipulated another handle. "It's in the bag."

***HOW CAN THE MONEY-SAVING QUALITIES** of new equipment be sold to management? Can a foreman "get away with it"? Would a "planning commission" help? Your ideas and experience on this subject will help others. Discussions of earlier topics appear on later pages.*

Practical Ideas



Light, Decorative Work Turned In Ellipse-Generating Chuck

LATHE WORK that isn't round can be turned out with an unusual chuck —one that does not copy a form, like a templet, but which actually generates an ellipse. The chuck is actually based on an old idea—books 200 years old refer to it—but probably few shop men are familiar with the idea.

A faceplate is built with two slots cut vertically in line with each other. A second faceplate, or a chuck, or even a disk (as illustrated) is attached with a sliding fit to the first plate by means of T-shapes and bolts. Dovetails may be employed instead of the T arrangement for better fit and more strength. In either case, the fit between the two plates must be a good sliding fit.

The inside faces of the T pieces ride against the outside diameter of a large collar that is formed to a fairly heavy backing plate. Two slots horizontally cut in this backing plate allow bolting the piece to the headstock of a lathe. The attached collar is hardened and ground after it has been machined to fit the backing plate. An oval opening in one plate clears the spindle nose of the lathe, which connects to the hub of the main faceplate.

A cutting tool is set at center height and, say, R in. from the spindle centerline. If the collar that is attached to the backing plate is on center, work swung on the disk (or chuck) will be turned round. If, however, the collar is set, say, E in. to the rear of the machine, an ellipse will be turned. The minor radius of the ellipse will be R in., and the major radius will be R + E in. The cutting tool can be set below center height, but this would make the calculations for a setup more difficult. *Michael P. Blake, Charleston, W. Va.*

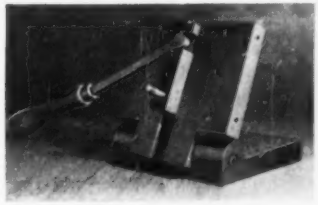
LATHE TAILSTOCKS can be aligned quickly and accurately with the use of a dial indicator and a bar of round stock.

The stock should be about the length of the lathe bed and ½ in. or ¾ in. in diameter. It is chucked in a collet, center-drilled, faced, and turned to a fine finish and for a true outside diameter. The indicator is mounted on the lathe toolpost.

The cross-slide is not moved, but the carriage is moved close to the headstock, a reading is taken on the indicator, and the carriage is moved down to the tailstock where the other end of the stock is supported. A reading here will indicate how much the tailstock is off, if any. *Norman W. Wyckoff, Verona, N.J.*

Adjustable Angle Plate Guides Dresser—Holds Setup

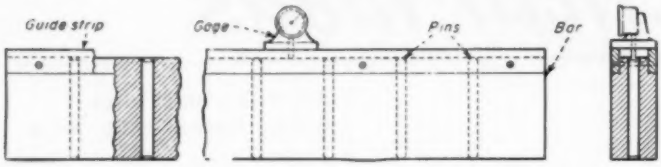
DIE WORK can be held for finishing on a surface grinder or any magnetic table with this angle plate. Adjustments are made with a conventional sine plate as a guide. Any angle up to 90° can be set. A T-slot in one plate guides a diamond-carrying slide for dressing an angle on the wheel.



Two plates, the slide, and a pivoted handle make up the special-purpose fixture. One plate is drilled and tapped in a convenient pattern so that work itself, or work clamped in a vise, can be bolted to the plate. The other plate is slotted longitudinally to match the profile of the dresser slide.

One end of the handle is cut to a flat circular shape, and this knob fits in a vertical slot in the dresser slide. This allows the slide to be levered up and down on the plate. A fixed pin in the handle slips into one of a set of holes along either or both sides of the plate.

Although we have both magnetic sine bars and angle dressers in our shop, the men seem to prefer this plate because it is smaller and quite a bit handier. *Al Lemprecht, St. Louis, Mo.*

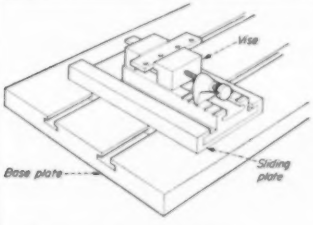


Parallel Bar Checks Irregularities In Long, Flat Surface

A LARGE parallel bar, ground on a Blanchard and drilled straight through down the center, allows checks of points along the top of a supposedly flat surface. Holes are about ¼ in. farther apart than the length of the gage base, and the pins are ground off 0.002 in. or 0.004 in. shorter than the holes—but all are the same length.

The bar itself is cast iron, and two cold-rolled-steel guide strips are screwed to its top edge to carry the gage. With the pins slightly shorter than the height of the bar, they are easy to find with the spindle of the gage.

Setscrews are provided to be tightened in notches in the pins so the bar can be moved without the pins dropping out, but normally the screws are backed off so the pins will be free. Special-length pins can be ground to gage slots or grooves, and pointed pins can be made so the depth of scraped marks can be found. *David T. Lyons, Sr., Belmont, Mass.*



Slideways for Drill Vises Abolish Clamping Time

WHILE WORKING on a three-spindle drilling and tapping machine, I discovered that I was wasting as much time in clamping and unclamping the three vises as it took to machine the parts. I devised a fixture that not only cut down on clamping time, but also made the vise setup rigid and eliminated twisting of the vises when the drills grabbed.

A large plate was T-slotted down its entire length, which was enough to extend beyond the two end spindles. A second, smaller, plate was slotted out to take the base of a vise, and was also fitted with T-bolts so it would ride on the base. The vise jaws were shaped square and at right angles to each other, a quick-acting clamp was attached, and stops were placed on the base to locate the sliding plate under each of the three spindles.

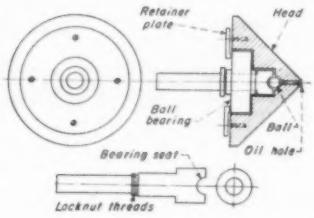
Once a new part was clamped in the vise, the sliding plate was moved to the three spindles in succession and drilling and tapping operations were completed. The T-nuts in the sliding plate served to prevent the vise from raising during machining, and the slotted plate and vise base allowed in-and-out movement of the vise for different setups. *Allan Clarke, Lancashire, England.*

Ball Bearing and Bearing Ball Support Tailstock Pipe Center

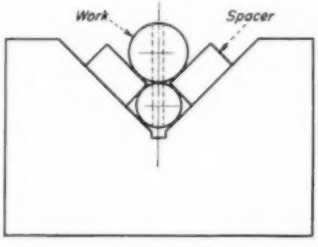
HERE'S a tailstock pipe center that will not heat up and score when pressure is applied. A single-row ball bearing absorbs radial thrust and centers the machined head, and one bearing ball directly behind the head absorbs longitudinal thrust.

Head diameter depends upon the largest pipe size that is to be centered—the head should be at least a half-inch larger on the diameter than the largest pipe. Most of the parts can be made from scrap, and the bearing can be anything handy—with around a 2-in. OD. The head should be machined off at about a 45° angle.

The bearing race should be a



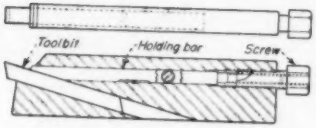
fairly tight fit on the shank, and retainer-plate pressure on the outer bearing race should be light. Two collars hold the bearing in place—one between the shoulder on the shank and the bearing, and another between the bearing and the locknut. The single bearing ball can be either made or salvaged from an old bearing. *Tyler G. Hicks, New York, N.Y.*



V-Block and Spacers Line Up Two Shafts

TWO SHAFTS of different sizes must sometimes be drilled through in exact alignment, and this simple method works surprisingly well.

Two ground steel spacers of equal thickness are made so one edge of each rests against the lower shaft, which is set in a V-block. The top surface of each block should then contact the larger shaft, which rests on top of the smaller one. If the spacing is right, this arrangement is perfectly rigid and can be easily clamped. *Roger Isetts, Kenosha, Wis.*



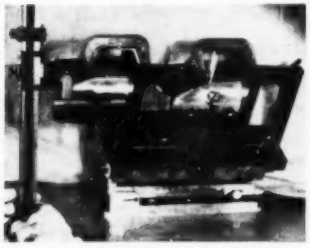
Lathe Toolholder Prevents Toolbit Breakage

TOOLBIT BREAKAGE and chip jamming between the end of the tool and the holder on lathes are two problems often encountered on heavy cuts. This toolholder has been designed to eliminate these problems, and, in addition, to serve as chip breaker. It fits on standard toolposts, but the design is more rigid for heavy cuts than the standard screw types.

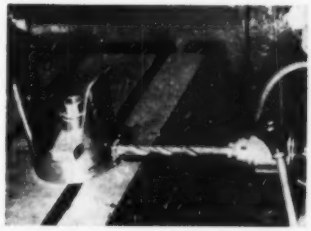
The holder consists of a steel block with a hole drilled near the top, to accommodate the sliding holding bar, and a square hole extending downward on about a 15 deg angle from the front face, in which the toolbit rests. A screw at the rear of the block is used to supply the pressure which holds the tool in place. *J. Martin, Monterrey N.L., Mexico.*

Layout and Scoring Method Matches Cams with Pistons

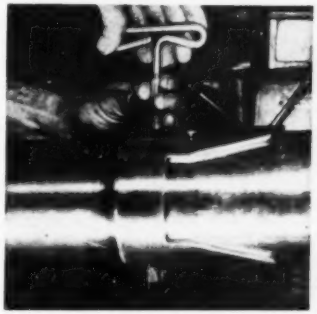
NOSE-WHEEL PISTON CAMS on C-54 transports are originally assembled to their pistons by studs that fit in matching threads. The tapping is done through both the cams and pistons, so replacement cams have to be tapped to match exactly. The method goes like this:



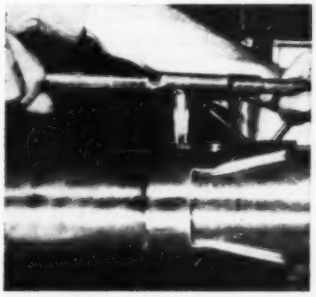
STUD HOLE on new cam blank is laid out to match the original cam on a double fixture with a sine plate and height gage.



MINOR THREAD DIAMETER for ⅜-in. pipe thread is drilled through both sides of cam. Next, cam and piston are mated, and



MACHINE-SCREW TAP (⅝-18NF) is used from inside piston to pick up lead of piston thread and score cam holes. Finally, ⅜-in.



PIPE THREAD is hand tapped by using scoring as a guide. This way the new cam thread matches exactly the old one and assembly is perfect.

Without such a method of matching threads, the original pistons would have had to be discarded with the damaged cams, so the system saves thousands of dollars' worth of pistons. *W. A. Hahn, Temco, Dallas, Texas.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

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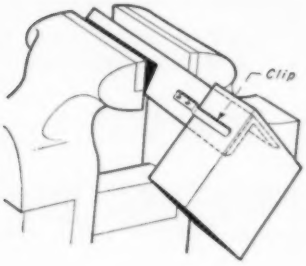
84th Winners—A Tie:

J. A. WALLER
Angled Forming Tool

A. VETSCH
Form-Tool Mathematics



Angle-Iron Jig Braces Box Corner for Repair

WHEN A CORNER is broken—on a sheet-metal box, for example—as a part is being formed in a power brake, a simple clamp will hold the corner so it can be welded.

Start with a length of angle iron. Fasten two flat spring-steel pieces to the iron by either spotwelding them or by bolting them in such a position that they will fit over the edges of the corner while the end of the angle iron is inside the part. Thus, the angle iron backs up the broken corner so welding can be done quickly.

If the welding is done properly, the box can be repaired without tacking the jib to it. If a slightly rounded corner is desired, the two spring-steel pieces can be fastened to the inside faces of the iron, the iron can be located on the outside edge of the box, and the box can be welded from the inside. *Alfred P. Rheingold, Brooklyn, N.Y.*

PRECISION FILING is usually difficult to do when the part is held in a vise on a conventional bench. Most benches are about 33 in. high so the operator will find it convenient to work on most workpieces—his forearm is usually horizontal so he can exert plenty of force. But delicate work requires little force and plenty of care, so if the machinist sits down in a chair in front of the vise, the work will be near eye level. He can then easily control his work. *Federico Strasser, Santiago de Chile.*

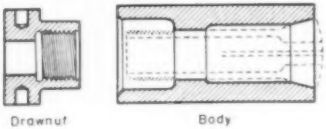
Collet Closer Handles Rough Dividing-Head Mill Work

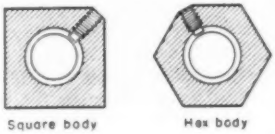
IF THE required accuracy of the finished work doesn't demand a dividing head, flats and suchlike can be milled with a simple gadget that holds the stock in a collet. The collet closer can be clamped in a regular milling-table vise, which means that setups will be quick and easy.

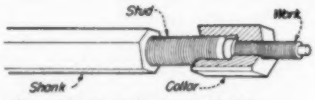
Cold-finished stock can be machined to a wall thickness of about 5/16 in. and left soft if the closer will not receive harsh treatment. (If you must abuse it, you'd be better off if you carefully throw the collets away before you start.) Machining will release work strains that should be allowed for in the finish-boring job. Outside faces should be filed flat and cut uniform in dimension, and the keyhole should be drilled and tapped with some accuracy.

The drawnut had best be made from hardenable steel, and should clear the hole in the closer. Threads to fit the end of the collets should be slightly loose.

With two closers, one square and one hexagonal, work can be milled off on up to six sides. If the keying setscrews are placed right, the work can be moved, in the same collet, from one closer to the other, and from one machine to another, or to a surface plate. Ordinary care in positioning the closer in the vise results in surprisingly accurate milling-machine work. *Lew Suverkrop, Bakersfield, Cal.*





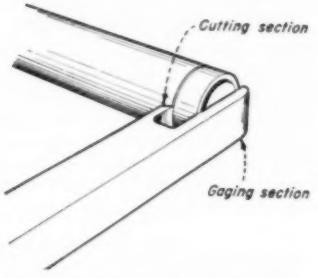


Threaded Adapter Holds Screws for Special Machining

THREADED ENDS on machine screws must often be altered to fit in new tools and machinery. The average small shop can't afford special collets, but the job can be done with a cheaply made holding device.

A driving shank that can be easily chucked is threaded inside for a fairly heavy stud. An adapter collar is then tapped for the large stud at one end, and is tapped at the other end for the screws to be worked. Both driving shank and adapter can be made from hex stock, which will make them easy to grip with wrenches and chuck.

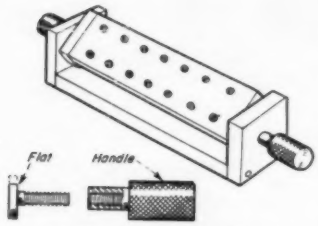
The adapter can be countersunk inside or not, depending upon what kind of screws must be held. Screws are assembled by running them into the adapter through the large threaded hole, and are jammed in place by backing up the adapter on the stud. *George F. Burnley, Oakland, Cal.*



Toolbit Acts as Gage, Too

AN ORDINARY toolbit may often be ground to speed up tubing cutoff if the rings are narrow. The tool acts both as a gage and as a cutter.

The projection on the right edge of the bit should be longer than the cutting shape ground on the left-hand edge so the carriage can be moved up to the chuck and stopped at the right position before cutting starts. It should be rounded and polished. *Ray Cafiero, Brooklyn, N.Y.*



Angle Fixture Holds Work On Magnetic Grinder Table

WORK to be ground at an angle on a surface grinder can be set up on a jig similar to the one illustrated.

Tapped holes are provided in a square pattern on the top plate for bolting down the work. The original jig was made from ⅝-in.-thick plate. The only machining that was not straight-line stuff was both end plates, which were rounded to clear the bottom plate. Handles were knurled on the two shafts, which were threaded so they would lock the plate at the angle at which it was set. *Ernest A. Stenzel, Baltimore, Md.*

Cast Iron as a Die Material

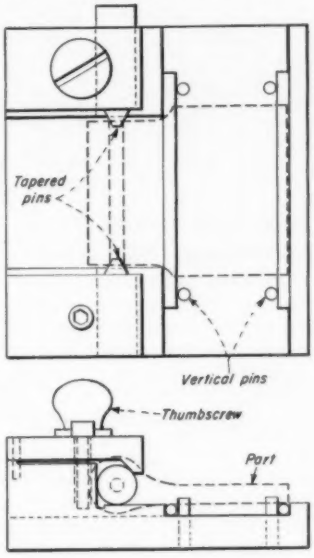
IN MY jobbing shop we have to make many dies for different industries, the main requirement being that the dies be cheap and strong enough to produce at least a hundred thousand pieces.

In order to accomplish this, I started experimenting with cast iron for forming dies and got really remarkable results. I have used both soft and hard cast iron, and have tried many different variations in iron composition. There hasn't been enough difference to matter between alloy steel and cast iron for these dies.

Steel, brass, and aluminum from 0.010 to 0.125 in. has been formed, and thicker gages have been worked after 0.010-in. radii were ground on the sharp corners. I haven't had a single complaint about cracked dies or failure.

I harden the iron by heating it to 1550F, leaving it soaking an hour for each inch of thickness, cooling in oil, then tempering at 500F for about three hours. This tempering is extremely important. It gives a hardness of about 50-52R_c in the center of the die, although there is a soft skin for about 0.005 to 0.010 in. Cast iron doesn't warp as much as steel, and the worry about overheating is not present.

After hardening, it cannot be drilled or turned, but it can be ground twice as fast as steel can. Normally I take a 0.003-in. cut on a tool-steel die surface with a surface grinder, but I can take a 0.006 to 0.010-in. cut on the cast iron with about the same wheel life. *J. H. Sperman, Brooklyn, N.Y.*



Touch-and-Gap Technique Gages Unusual Parts

HERE IS an unusual gage that was made to check an unusual part. The distance from the center of the hole in the part (dotted in the illustration) to the lower face of the part has to be 0.343 in. ± 0.001. Tolerance on the hole was only plus 0.002, minus nothing. Any allowance in the gage had to be practically eliminated.

Two tapered pins were ground to locate the hole in the part. One was fixed, but the other could be loosened by a thumbscrew so the part could be inserted in the gage. Both pins were held by wedging clamps that held them against a shoulder on the base of the gage.

Four vertical pins in the base of the gage located horizontal pins, which could be changed. The gage was made so two sets of these pins would indicate the distance from the hole to the lower face on the part. Two 0.188-in.-dia. pins would indicate that the dimension on the part was 0.342 in. Two 0.186-in pins would indicate 0.344.

To be within limits, the part would touch the pin closer to the bore and clear the other if 0.188-in. pins were used. With 0.186-in. pins, the part would touch the outer pin and clear the closer one. *Robert Mery, Farmingdale, N. Y.*

How to Cut Metric Threads

A SPECIAL change gear of 127 teeth is required before one can cut metric threads on a lathe equipped with an English-system leadscrew. Jobbing shops that have no special gearing setups can do this with only a slight error.

The length of 6½ in. is roughly equivalent to 165 mm, so if:

H = lead of lathe leadscrew in in.
J = lead of thread to be cut in mm
K = number of leads on leadscrew in 6½-in. length
T = number of leads on thread to be cut in 165-mm length

$$K = \frac{6.5000}{H} \text{ and } T = \frac{165}{J}$$

Change gears will be:

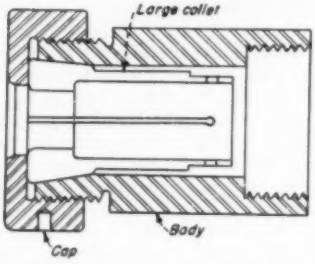
$$\frac{N_1 \times N_3}{N_2 \times N_4} = \frac{K}{T}$$

For example, cut a thread with a lead of 1 mm with a 4-tpi leadscrew:

$$K = \frac{6.5000}{0.250} = 26 \quad T = \frac{165}{L} = 165$$

$$\frac{K}{T} = \frac{26}{165} = \frac{20 \times 65}{110 \times 75}$$ or any other combination of change gears that gives the same ratio.

The error per lead amounts to about 0.0000239, which is well within ordinary commercial limits. *J. Martin, Monterrey, N.L., Mexico.*

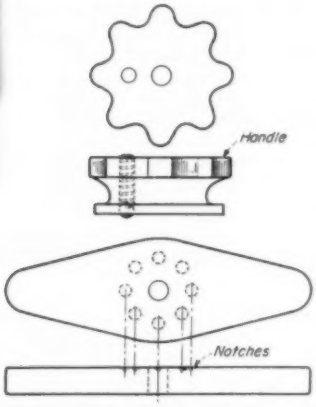


Adapter Takes Larger Collet

A SMALL SHOP increased the capacity of its collet lathe by means of an adapter that extends the spindle. Spindles normally limit the capacity of work that can be held in a collet to a diameter that is about ½ in. less than the spindle ID, but this adapter allows work up to the actual spindle ID to be held.

The body of the adapter is threaded to fit the spindle, and its inside diameter is bored to the shape of the inside of the spindle. An external thread near the end carries a cap that confines the newer, larger collet.

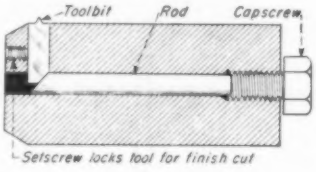
Pin-wrench holes are drilled in the cap so the collet can be closed with speed. *Maurice Conklin, Toronto, Ontario.*



Spring and Ball Retard Action of Fixture Clamp

HAND-CLAMPED JIGS and fixtures can be made to hold better if some means, other than the drag of the screw, is used to prevent motion of the clamping screw. The clamp illustrated is limited in motion unless the operator exerts excessive pressure on the clamping knob.

A hole is drilled and tapped in the wheel, and a setscrew locates a spring that backs up a ball. Notches in the body of the fixture are cut with the tip of a drill. Depending upon the strength of the spring and the adjustment of the setscrew, the knob can be easy or tough to turn, and it can be adjusted so the fixture cannot loosen up unless it is purposely opened. *R. A. Lachmann, Chicago, Ill.*



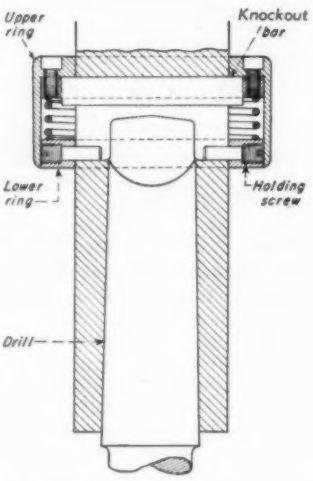
Single-Point Threading Tool Taps Large or Odd Profiles

AFTER I wrecked the threads in the ejection cylinder on our die-casting machine, I made a single-point tapping tool that is good for large and odd threads.

A long bar was turned to the root diameter of the thread, and then was drilled through the center and slotted near one end. A single toolbit was set in the slot after the thread form had been ground on one end and a 45° angle had been ground off on the other end. A ⅜-in. rod was also ground off at the same angle and was slipped into the center hole. This was forced against the end of the toolbit by a screw in the end of the block, which raised the toolbit out of the slot.

A 3-8 nut was tack-welded onto the end of the work, exactly on center, so the depth of cut could be easily found. A number of passes were required before full depth was reached, and the nut was removed before the finishing cut was made.

Similar adapters can be employed for threads of unusual profile or with excessive depth. *John Settle, Denver, Col.*



Automatic Drill Release Clears Drillpress Spindle

RELEASING taper-shank drills from drillpress spindles is a two-handed job when a hammer and drift are used. This is one routine shop job that can be easily speeded—by an attachment like the one illustrated.

A hard steel bar is inserted in the knock-out hole in the spindle, and is held in place by a ring and a pair of screws. When the spindle is raised with a quick movement of the feed lever, the ring-and-bar assembly contact the lower face of the spindle housing and the bar is driven hard against the top of the drill—thus releasing it from the tapered hole. This action is quick enough that small drills can be released without stopping rotation of the spindle.

To hold the knock-out bar clear of drills when they are inserted, a light coil spring presses it up against the top of the knock-out slot. The bottom of the spring bears against a lower ring which is held by two pin-end screws that rest on the bottom of the slot.

The top ring can be extended down to form a skirt over the lower ring—this improves appearance and keeps out dirt. Both ends of the bar are sunk into the upper ring so the spring can bear against a flat surface. *F. E. Riley, London, England.*

NEWS OF METALWORKING

OEEC Tool Plan Raises Imports

WASHINGTON—A revised 1949-50 program submitted by participating countries to the Organization for European Economic Co-operation shows an increase in estimated consumption, calling for more imports of machine tools and a cut in exports. But imports from the United States have been reduced slightly from $81 million to $78 million.

The revised program has been detailed in a report issued by the OEEC in Paris. Not an official ECA document, the report follows a study made by the Machinery Committee of the OEEC on the overall production and trade in machine tools in Europe. A machine tools working party was instructed to make a critical examination of the imports of machine tools from the U. S. contemplated in the revised 1949-50 program, and was asked in particular to ascertain to what extent some of the orders foreseen for the U. S. could be switched to Europe.

Increase in Consumption Shown

The first machine tool inquiry made in Dec., 1948, obtained these figures for participating countries: Production, $450 million; imports, $158 million, of which $81 million from the U.S. The export figure then was $198 million which, subtracted from production and imports, put consumption at $410 million.

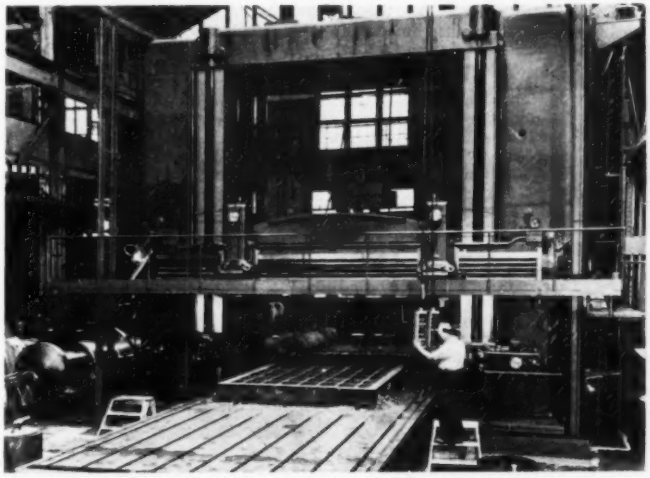
Corresponding figures in the revised 1949-50 program are: Production, $450 million; imports, $175 million, of which $78 million from the U.S.; exports, $169 million. This puts consumption at $456 million, an increase of $46 million over the previous program.

Intra-European Trade Shown

Intra-European trade in the first inquiry was estimated as follows: Exports, $79 million; imports, $71 million, for a surplus of $8 million. Revised figures are: Exports, $75 million; imports, $89 million, for an apparent deficit of $14 million.

Overall estimates for exports to the dollar area have been cut due to a sharp fall in the Italian forecast, which has been cut by two-thirds.

The ratio of imports of machine tools from the U. S. to consumption by participating countries is shown in the chart in Gaging Metalworking, page 86.



***GIGANTIC PLANER** and milling machine, capable of shaving a sliver 1/1000th in. thick from a steel block the size of a railroad boxcar, has been placed in operation at General Electric Co.'s Schenectady Works. Built by Consolidated Machine Tool Corp., Rochester, N. Y., it will be used in making equipment for industrial and power generating applications*

New Casting Process Is Handled In Dies in Hydraulic Presses

NEW YORK—Continuous pressure exerted by conventional upright hydraulic presses is used to coin aluminum and brass castings produced in steel dies. As a result of this variation of the die-casting technique, the "Bacco" process is said to improve the rated physical properties of standard aluminum alloys by 10-40 percent.

No special equipment is required to handle the process. Plants equipped to melt non-ferrous alloys and possessing hydraulic presses can use the method to produce intricate parts in preference to permanent molding.

Molten Metal Flowed In

In describing the operation, Harold Budds, president of Budds Aero Castings, Inc., Canaan, Conn., said steel dies are built to part dimensions, set up in the press, and molten metal is flowed in. Application of hydraulic pressure from the press ram is started while the metal is still filling the die cavity, and is continued and intensified until after the metal has solidified. In this way, the "shot" is made dense, porosity is reduced to a minimum, and the physical strength is built up by "coining" action.

Military Application

Under development for four years, the Bacco process has been used primarily to date for production of castings for military purposes. Currently, the major share of a large military order is being produced by a New England sub-contractor. A Detroit firm is also getting ready to make parts by the process, and automotive interests are investigating the method.

4-lb Casting Made

Largest casting made to date is about 4 lb in weight and a 100-ton hydraulic press is required. It is anticipated that certain automotive parts may require a 3000-ton press.

Budds Aero is now working with two licenses and is in a position to conclude licensing arrangements with other firms that possess adequate equipment and technical ability.

Still No Machine Tools for Stalin; He's Losing Manganese Market, Too

WASHINGTON—Stalin's attempt to put the squeeze on U. S. steel production has boomeranged. After a six months' embargo on Russian manganese shipments to the U. S., he still can't buy any American machine tools. And U. S. industry is finding it easy to buy its manganese requirements elsewhere.

In fact, this year, industry expects to supply the estimated 1.4-million long tons of ore it needs without Russian help, and without dipping into the 570,000 ton inventory. And at no real increase in cost. This is bringing Stalin face-to-face with the possibility that Russian manganese may lose the U. S. market for good.

Shipped 20,000 Tons Here

That's why, during July and the first two weeks of August, Stalin allowed some 20,000 tons of manganese—the first, really, since February—to be delivered to U. S. importers. He hoped, maybe, the U. S. would start trading again, machine tools for manganese. Putting Russian manganese back on the American scene was almost as important as getting the tools. But Commerce Department's Office of International Trade never flickered an export license, and now ore shipments have been halted again. Best bet is Stalin will make another feint around December.

Meanwhile, U. S. industry worries over manganese supplies have eased a lot since last March. Increased ore deliveries from other sources have come within 150,000 tons of meeting normal domestic requirements for the first six months of this year.

Here's how first half-year 1949 deliveries to the U. S. from our three biggest suppliers today stack up with 1948 full-year figures:

From India, 190,576 tons in 1948, and 157,142 tons in first six months of 1949; from Union of South Africa, 183,370 in 1948, and 157,142 first half of 1949; from Gold Coast, 118,724 in 1948 and 107,142 tons in 1949.

U. S. stockpiling program, however, has suffered a setback. But if Congress restores the long-range contract authority of the Bureau of Federal Supply, there won't be any permanent harm done—only some delay. Contracts guaranteeing a market for 10 or 20 years would be the key to heavy investment in such known reserves as exist in Brazil, Belgian Congo, Angora, and Turkey. Development of full-time production of these sources would noticeably lessen Russia's chances of ever regaining first place in the U. S. manganese market.

7-Shop Connecticut Group Now Set for More Business

HARTFORD, Conn. — Connecticut Mechanical Industries, Inc., comprised of seven Connecticut tool and die and contract manufacturing shops, has announced through J. H. Dowd, president, that the seven-shop corporation has now fully organized and is in a position to handle a large additional volume of business.

With combined assets of over $1 million and 90,000 sq ft of floor space, the group offers the specialized skills of each shop, over 650 fully equipped machine tools and several hundred skilled craftsmen, making it possible, Mr. Dowd said, "for eastern industry to procure from one source all the wide variety of tool and machine work from 42" Bullards to the finest instrument components and every type of special machine and tool."

***FIRST JET-POWERED** passenger airliner is this de Havilland Comet, powered by four de Havilland Ghost jet turbines. The airliner has undergone test flights and will be in service on British Airways in 1952. Plane will have a cruising speed of 500 mph and will carry 36 passengers. Sixteen planes are now in production*

End-Use Restrictions on Tin Lifted; Some Controls Stay

WASHINGTON — Restrictions on uses of tin were eliminated last week in a sweeping revision of Commerce Dept.'s basic tin conservation order M-43.

Although end-use restrictions of M-43 are ended, the general framework of the order remains in effect and the following controls will continue to be exercised: (1) Allocation of all pig tin; (2) inventory controls of pig tin and all materials containing tin; (3) reports by holders, distributors, importers and users of tin; (4) import controls on pig tin and materials containing tin.

Controls over tin imports by private firms will be maintained under the procedure established earlier in the year to regulate imports of off-grade metal. These controls are now expanded to permit relatively free import of all grades of pig tin.

All pig tin containing less than 99.65% tin, and all private imports of pig tin of any tin content, will be allocated to manufacturer without regard to end use.

RFC stocks of pig tin containing more than 99.65% tin will be distributed to users according to present allocation quotas.

New Indian Law Permits Free Machinery Imports

BOMBAY (McGraw-Hill World News)—Machinery of many basic types continues freely importable into India from the sterling area under a new and greatly restricted Open General License XVI. The new license covers only 20 items compared with the hundreds on the old one, which was dropped when it was discovered that unrestricted imports from the U.K. had created a tremendous trade deficit.

Items not on the new OGL are not necessarily prohibited as imports, but are instead subject to licensing which will permit the government to avoid overstocking on speculative grounds and imbalancing of overall requirements.

The new list includes ball and roller bearings, taper bearings, pneumatic plant and auxiliaries, industrial fans and blowers, polishing bobs and wheels, machinery and parts thereof excluding typewriters and sewing machines, textile machinery, dyeing and bleaching and other finishing machinery, printing and lithographing equipment, farm implements.

Cost-Cutting Will Be Theme Of Giant ASTE Exposition

PHILADELPHIA—Convention Hall and Commercial Museum here has been selected as the site of the American Society of Tool Engineers' giant industrial exposition Apr. 10-14, to be devoted exclusively to display and demonstration of latest cost-cutting equipment and methods.

Final plans, now being formulated, are expected to take into account cost-cutting needs of large corporations and those of the thousands of smaller and medium sized companies. Also, studies are being conducted to determine the best ways in which the exposition can be used to assist foreign industries in their own rehabilitation.

5½ Million Wage Earners Employed in Metalworking, Inventory Reveals

NEW YORK—Metalworking today employs 5,660,000 wage earners in 57,800 plants of all sizes, according to figures released this week by the editors of AMERICAN MACHINIST. This estimate is the result of work on the Mid-Century Inventory of Metalworking Equipment, which will be published November 3.

This compares with 5,825,000 employees in 59,000 plants in 1947, it is estimated. Considering that 1947 represents the peak post-war period, the industry as a whole has continued at a remarkable pace.

The estimates are based on the 1947 and preliminary 1949 McGraw-Hill Census of Manufacturers and the 1947 U. S. Census of Manufactures. The 1947 U. S. data is now being released piecemeal and the 1949 McGraw-Hill data will be available later this fall.

According to the preliminary 1949 McGraw-Hill Census there are 19,499 plants with more than 20 workers in the metalworking industry. These plants employ 5,445,500 wage earners. The McGraw-Hill Census does not report plants with less than 21 workers.

The Mid-Century Inventory, which will be the most detailed in the series published by AMERICAN MACHINIST at 5-year intervals since 1925, will include data from the McGraw-Hill Census on the number of plants and employees in each of the industry and area groups on which equipment data will be presented.

The Inventory will report on 156 different kinds of metalworking equipment, showing how many units by age groups are in each of 15 industrial groups and 25 geographic areas.

***NEW INSTRUMENT** devised by H. L. Cook, Warner & Swasey gauge veteran, facilitates checking of large machinist's squares. It consists of a rectangular steel bar normalized, hardened and ground, suspended vertically from a heavy welded frame by means of a ball bearing pivot. At the bottom of the bar an indicator lever with a 2-1 multiplying ratio is applied, so that when a square is placed against the bar, the latter swings to register any error for the entire length of the bar. At the end of the pivot, which extends beyond the back side of the supporting frame, a horizontal bar is mounted with weights at either end. These weights can be moved to equalize the pressure of the vertical bar against the square. In use, a square is placed against one side of the vertical bar. If an error reading is obtained, it is confirmed by placing the square against the opposite side of the bar to obtain the same reading*

Chucks Face Import Duties in Australia

MELBOURNE—The manufacture of metalworking chucks, one of the many war-born Australian industries which are hard put to meet resurgent international selling competition, was discussed in hearings of the Commonwealth Tariff Board against a global background of chuck-making economics.

Five Australian makers testified in favor of import duties of up to 65% ad valorem on metalworking chucks.

These firms between them have developed a limited range of drill chucks, non-electric magnetic chucks, three-jaw self-centering lathe chucks and four-jaw independent lathe chucks.

An official of Edwin Wood Pty. Ltd., sole Australian agents for the Jacobs Mfg. Co., Hartford, Conn., quoted Jacobs' president as authority for the estimate that prewar world production of drill chucks was worth only about $800,000 and that Jacobs chucks represented 80% of this. Up to and including the war years, Jacobs supplied 80% of the English requirements also, but nevertheless rejected as economically unsound a proposition to set up a branch plant in England. The implication was that an industry that wouldn't pay to establish in England better be left alone in Australia. Eighty-five percent of the Australian demand for drill chucks was claimed to be for the Jacobs type although no firm produces it.

Tool Business In Britain Looks Up

By H. E. LINSLEY
Associate Editor

LONDON—With order books bulging and plants running at full capacity, the British machine tool industry is now looking forward to several years of excellent business. Principal snag, however, is the chronic shortage of skilled manpower which is forcing most plants to operate on a single shift. As a result, heavy equipment such as large planers and boring mills is being quoted at 4 yr delivery, and some customers, unable to wait this length of time, are placing orders for this type of machine with American manufacturers who can deliver in a matter of weeks.

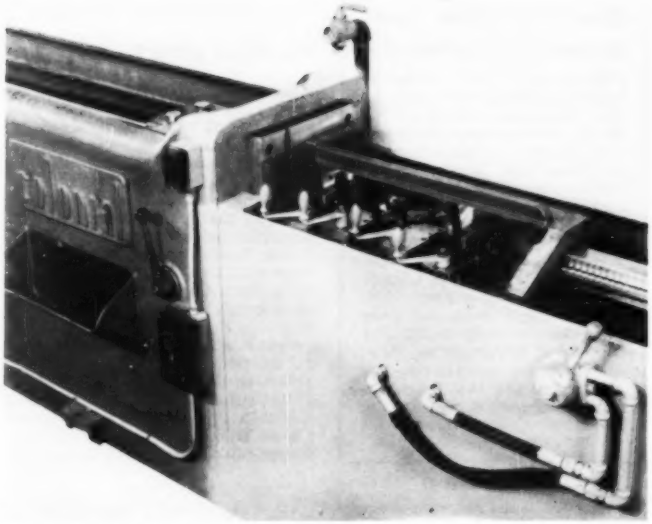
No Plant Expansion

During the war, British builders were able to do very little in the way of plant expansion, partly because of building restrictions, and partly because the urgency of the machine tool program demanded immediate action. Moreover, manufacturers were unwilling to be left holding the bag with factory buildings too big for their normal needs. Today, with a certain amount of plant expansion urgently needed, it is next to impossible to obtain the necessary government permits to build, requires 2 to 4 yr to get delivery of production equipment, and at the end of all this, it is quite impossible to recruit the skilled labor to man the new plant.

The new education act, requiring boys to stay in school until the age of sixteen, coupled with compulsary military service at the age of 18, has put a major obstacle in the way of apprenticeships. Time in the armed services is counted as part of the apprenticeship, so the young journeyman, at 21, has had only 3½ to 4 yr training, which is insufficient for the type of skilled work he should be able to perform. There is, moreover, a certain wastage in the form of boys who, after 12 to 18 months in the army, decline to resume an apprenticeship.

Emphasis on Standard Machines

Emphasis in all lines is, essentially, on standard machines. Manufacturers generally do not have the type of market to justify the use of special, single-purpose, high-production machines, and where these are needed it is usually considered preferable to purchase them from American builders who have had long experience in their construction. Application of electronic controls is proceeding with great caution, and most customers seem to prefer the reliability of old and trusted positive mechanisms. Furthermore, production runs are usually relatively short and the savings realized by special controls are not sufficient to justify their higher cost.



***BROACHING TWO** different materials at same time is accomplished by this machine. It solves the problem of finish machining different parts in relation to each other. Machine is a 10 ton 72 in. stroke Colonial Universal Horizontal, with double toothed broach guided full length of its stroke. Parts to be broached are held in place by cams, locating plungers and equalizing clamps. Machine has been used at the Underwood Corp. for broaching V's in typewriter carriages*

Designs were largely frozen during the war, but the new machines indicate that wartime lessons have been well learned. Cleaner, smoother lines are much in evidence, and controls have been well grouped for maximum operator convenience. Safety devices are much in evidence, as British factory regulations are extremely strict in this regard.

Export Picture Given

Exports have always formed an important part of Britain's machine tool business as, without the increased volume thus afforded, development costs for new equipment would fall too heavily on the limited domestic market. Overall target in the present export drive was set at 40%, but unofficial estimates place the actual achievement at about 33%. Some companies exist almost entirely on export and their products are rarely seen on the domestic market. Others, whose machines are urgently needed in the home market, are doing virtually no export business.

Total production for 1948 was 44,840 machines with a value of 31,090,000 pounds sterling. Of these, 15,432 machines having a value of 11,243,000 pounds were exported. For the first 3 months of 1949, total production was 11,134 machines with a value of 8,783,000 pounds, of which 4009 were exported to a value of 3,299,000 pounds. These government figures do not include used and low-cost machines. For an industry employing less than 76,000 workers, including 13,000 women, this is an impressive total.

By far the largest customer for machine tools in 1948 was India which bought to the tune of 2 1/3 million pounds. Australia was next with 1½ million; then South Africa with 1¼ million, and Central and South America, France, and Netherlands, each with over 1 million. Figures for 1949 are not yet available, but there is little doubt that the same pattern will develop. And despite all newspaper propaganda to the contrary, Soviet Russia received less than 66,000 pounds worth, the lowest of any country except Lebanon.

Paid in Sterling

Noteworthy is the fact that the greater part of all exports are paid for in sterling, not in Marshall dollars. There has been some misunderstanding on this point. When the various Marshall aid countries were instructed to specify their machine tool needs from both Britain and the U.S., they were required to quote these in U.S. dollars. This gave rise

to the impression that the British quota was to be purchased with U.S. dollars, and as the requirements from Britain were somewhat larger than from the U.S., it was assumed in some quarters that Marshall dollars were to be used to build up the British machine tool industry, to the detriment of American builders. Actually, purchases from Britain were made in sterling from the reserves available in the various countries, thus conserving dollars for purchases which could be made only in the U.S.

One reason for the expressed preference for British tools is in their greater simplicity. In countries just beginning to develop industrially, there is a serious problem in the shortage of skilled labor. White, black, brown or yellow, the unskilled worker can be taught to operate a simple machine in a short time and can soon keep pace with the relatively small production demand. The more complicated American machine requires longer training and may involve difficult problems for the type of maintenance crews available. Furthermore, its high production rate is not as yet necessary.

This flourishing condition of the machine tool industry does not, however, furnish much assistance in solving Britain's dollar shortage. Exports to the U.S. are practically nil, but imports, payable only in dollars, amount to 3¼ million pounds ($13 million) in 1948. This is an important slice of business for American builders and will almost certainly be the first and most severely cut in the event of Marshall aid reductions.

Industries Important to Metalworking Hit in Anti-Big Business Report

WASHINGTON—A number of industries important to the metalworking industry are singled out in a new anti-big business report the Federal Trade Commission has made to Congress.

Its title: "The Concentration of Productive Facilities."

The report spells out how a few companies in each of 26 industries own a large percentage of the total assets of the whole industry. Its purpose: to help along the anti-monopoly legislation being proposed in Congress and to help out Rep. Celler's House committee now conducting a running investigation on big business.

Report Shows Percent of Assets Owned

In summary, FTC's report shows the following percentages of their industry's total net capital assets as being owned by the largest companies in the industry:

In steel, the two largest companies (U.S. Steel and Bethlehem) own 42 percent; the eight largest own 69.3 percent.

In copper smelting and refining, the three largest (Anaconda, Kennecott and Phelps Dodge) own 88.5%; the eight largest own 99.9%.

In aluminum, the three producers that make up the entire industry (Alcoa, Raynolds, and Permanente) own (or lease) 100 percent.

In electrical machinery, the three largest (General Electric, Westinghouse, and Western Electric) own 41.7 percent; the eight largest, 55.2 percent.

In agricultural machinery, the largest company (International Harvester) owns 45.3 percent; the eight largest, 82.1 percent.

In office and store machines and devices, the three largest (IBM, Remington-Rand, and National Cash Register) own 69.5 percent; the eight largest, 85.3 percent.

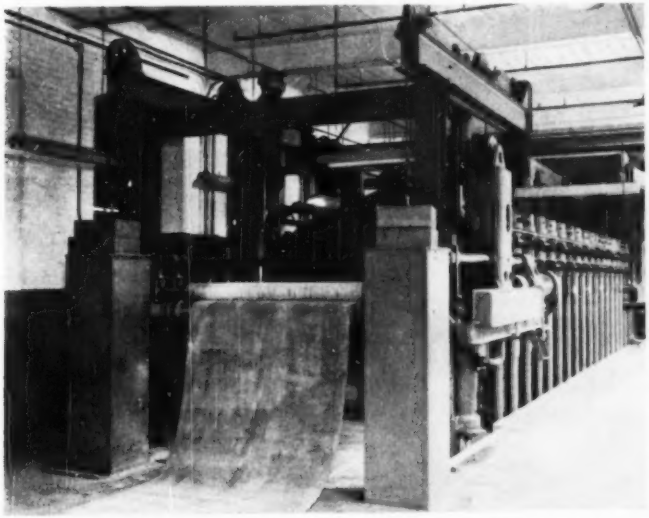
In motor vehicles, the three largest (General Motors, Ford, and Chrysler) own 68.7 percent; the eight largest, 77.3 percent.

In aircraft and aircraft parts, the four largest (United, Curtiss-Wright, Bendix, and Wright Aeronautical) own 44.0 percent; the eight largest, 73.7 percent.

In plumbing equipment and supplies, the two largest companies (American Radiator, and Crane) own 64.9 percent; the seven largest, 77.9 percent.

The FTC analysis will be ammunition next year for anti-monopoly Senators like O'Mahoney, Kefauver, and Long in pushing for Senate approval of the anti-merger bill already approved by the House. That's the bill that closes a loophole in the Clayton Act by giving FTC power to block mergers accomplished by one company's buying up the physical assets of another, where the effect is to substantially lessen competition.

FTC now has the power to block such mergers resulting from a company's buying up the capital stock of a competitor. But this authority hasn't been effective since merging by acquisition of assets was ruled legal by the Supreme Court years ago.



***HYDRAULIC PRESS** built by Baldwin Locomotive Works has been put into successful operation at the Passaic, N. J., plant of the Manhattan Rubber Div., Raybestos-Manhattan, Inc. This hydraulic press for conveyor belts, weighing 619,000 lb, vulcanizes conveyor belts under controlled pressure and temperature*

Machine Tool Distributors Point to 25 Years' Service

PHILADELPHIA—Marking the completion of 25 years of service to the metalworking industry, the American Machine Tool Distributors' Association has published a brochure outlining the founding of the organization and listing the 155 members of the association.

The brochure points out that the asosciation was conceived in 1924 by the executives of twelve of the leading machine tool distributors. It was founded "to promote cooperation between members in establishing an understanding of the requirements of industry and to promote a closer relationship among builders, distributors and users of machine tools."

Detroit

ENLARGED MANUFACTURING SCHEDULES REFLECT ENTHUSIASM OF AUTOMOBILE BUILDERS . . . CHRYSLER MAY POSTPONE CHANGEOVERS

Detroit has gone optimistic, and without reservation. It is looking on the near-term market for automobiles with undiluted enthusiasm. It is backing up that enthusiasm with enlarged manufacturing schedules between now and the end of the year.

To review, the viewpoint in Detroit was a worried one at the turn of the year. For the first time since the end of the war volume had fallen off enough that dealers were able to make deliveries almost immediately from stocks on hands; some had run out of ready customers. The spring upturn came along just in time to salvage any "situation" which might have occurred.

As the upturn continued in to the summer, automobile executives kept their finger crossed. They anticipated that by Labor Day the crest of the wave would have been passed, and demand would taper off in traditional seasonal fashion.

That crest has passed, true. But the wave was of such tidal proportions that the undertow behind it is maintaining demand at a rate the factories are having trouble satisfying. A seasonal pattern may well be present, but for the nonce it is established on such a high level that it has little practical application.

The manufacturers, consequently, are straining at their production harnesses, both for the present and for the future. One way to see the effect of this is in the changed pattern of ordering on steel.

Flat Rolled Shortages Ended

Steel became easier in June and July; the end of the lengthy shortage of flat rolled products finally appeared. Simultaneously, ordering fell off. Deliveries were quoted in something like six weeks or so—salesmen for mills were out looking for business. Nibblings of enlarged buying began to appear in midsummer, and were attributed—and doubtless truthfully—to fears of a steel strike, to desire to have some inventory on hand.

That buying continued. As the turn was made into August, however, the sales reports to the automobile merchandising departments began to filter through to top policy planning levels, and to reflect back into purchasing plans. Steel buyers went into the market more intensively.

When August started they could get space on many mill books for late September delivery. When August ended the delivery books had been filled up not only for September, but for October and November as well. Some producers were not quoting sheets before mid-December delivery. For the first time since spring some random gossip was being heard about steel shortages. Shades of the postwar days!

BRUCK *is the name given this unusual vehicle, a combination bus and truck. It has been delivered to the Northern Pacific Transport Co. by the Kenworth Motor Truck Corp. of Seattle. It is being operated out of Billings, Mont., to supplement short line rail service. F. R. Meehan, superintendent of Northern Pacific Transport, thought it up and Kenworth engineers developed the plans. The vehicle accommodates 17 passengers and provides a freight carrying space 18 ft long and 8 ft wide. It is equipped with a Hall-Scott horizontal engine*

Strike Fears Speeded Buying

The reason for the speedup in steel buying in August was partly a fear of steel strikes, but it was grounded even more solidly in the facts of automobile life last month. Manufacturing volume soared to a dizzy total of 677,979 assemblies, the highest for any month in history, 15,000 or so above the previously record total in April 1929. Furthermore, schedules ahead called for little abatement in the daily date, although monthly totals will be lower—August had 23 working days.

Postponement of Changeover

The story was even heard that Chrysler Corp., impressed by the size of the market, was contemplating postponing its 1950 model changeover dates. Earlier these had been decided on for November. But inevitably they would take a few days of production off the books. Belief was being expressed that Chrysler would delay its changeover till December or the first of the year, thus saving that output.

In the light of the cheerful contemplations of present day Detroit, it seems evident that the more conservative forecasts for 1949 volume will have to be revised upward—quite definitely. As of the end of August, total production in U.S. and Canadian plants had exceeded 4,500,000 units, and that total was being added to at a rate of approximately 150,000 a week. Even allowing for some dwindling because of changeovers and seasonal curtailments for scattered producers, a 1949 assembly total of approximately 6,000,000 cars and trucks in all plants seemed quite possible. The all-time record, established in 1929, was 5,621,045.

The one factor which could explode this anticipation would be a lengthy strike situation in both the steel industry and at Ford. As regards steel, the industry is prepared to keep on producing until at least the end of October without new shipments, possibly longer in some instances. If a strike ended before that time, of course, the shutdowns resulting from steel shortages would be definitely limited.

Insofar as Ford is concerned, that manufacturer has been contributing about 30,000 units a week to the aggregate. A strike, therefore, would clip upwards of 130,000 or so vehicles per month from industrywide totals. Any extended walkout in the Ford plants would obviously be of major effect on the manufacturing rate.

Body Builders to Meet

Some new thoughts on automobile body building should come out of the American Society of Body Engineers' meetings in Detroit, Nov. 2-4. Body styling, materials, and production engineering are among topics scheduled for eight panels.

Names in the News

John F. Miller

John F. Miller has been appointed manager, Tool Div., Illinois Tool Works, Chicago. He was formerly sales manager, Machine Tool & Cutting Tool Div., Ex-Cell-O Corp., Detroit, and served with the tool division of the War Production Board.

Wilbur D. Prescott has been elected assistant treasurer, and **Charles A. Dilley** assistant secretary of Cleveland Graphite Bronze Co.

George M. Lange has been named regional sales manager for the midwest area of Tyson Bearing Corp., Massillon, Ohio.

S. B. Withington, newly-elected vice president of Avco Mfg. Corp., New York, has been named general manager of the Lycoming-Spencer Div., newly formed from integration of the Lycoming and Spencer Heater Divisions into a single operating unit. Former general manager of Avco's Republic Aircraft Products Div. at Detroit, Mr. Withington took over supervision of the Lycoming and Spencer Heater Divisions at Williamport, Pa., in December 1948.

Brig. Gen. Elbert L. Ford, commanding general of Aberdeen Proving Ground, will become Chief of Ordnance and be advanced to major general upon the retirement, Oct. 31, of **Maj. Gen. Everett S. Hughes.** A West Point graduate, 1917, Gen. Ford went to the Ordnance Dept. from the Coast Artillery in 1920. From 1934 to 1937 he was assistant commandant of the Ordnance School at Aberdeen. At the start of World War II he was sent to London as chief of the ordnance maintenance division of the European Theater of Operations. In 1942 he became chief of ordnance operations at Allied Force headquarters in London. In 1944 he returned to the office of Chief of Ordnance in the Pentagon as chief of the maintenance division. At the close of the war he was assigned to the ETO as ordnance chief, returning to become commanding general at Aberdeen in 1948.

Clarence J. Marx has been sent abroad by The Reliance Electric & Engineering Co., Cleveland, to establish headquarters in England for extension of application engineering services to European users of the company's products.

John H. Biggs, former Rochester representative, has succeeded **Thomas F. MacLaren** as Brown & Sharpe Mfg. Co. representative in the Philadelphia office. Mr. MacLaren will assume other responsibilities with Brown & Sharpe, Providence.

A. P. Schmauch has been named manager of industrial engineering, Rockwell Mfg. Co., Pittsburgh. Prior to joining Rockwell he was with Albert Ramond & Associates as a consulting production and industrial engineer. He was also affiliated with Armco Steel Corp., Republic Steel Corp., and Pharis Tire & Rubber Co.

Frank W. Blanchette

Frank W. Blanchette has been appointed representative of the Sheffield Corp., Dayton, and its subsidiary, the Murchey Machine & Tool Co., for the territory that includes greater New York City and a large portion of New Jersey. He will maintain his offices at 965 Broad Street, Newark.

W. A. Brown, Jr. has been named vice president and general manager of The Liquid Carbonic Corp., Chicago. He was formerly vice president of the Compressed Gas Division at New York.

Joseph H. Parsons and **Robert B. Pogue** have been appointed vice presidents and **Rosser L. Wilson** has been appointed chief engineer of the Brake Shoe & Castings Division of American Brake Shoe Co., New York.

James L. Byrom, manager of the Chandler-Evans Division of Niles-Bement-Pond Co., West Hartford, Conn., has been elected vice president of N-B-P. **Isham Keith** has been appointed machinery manager of the New York branch office of the Pratt & Whitney Div., succeeding **Harold F. Welch,** resigned.

A. H. Loux has been named manager of distributor sales for Flexible Tubing Corp., Branford, Conn.

S. B. Withington

A. P. Schmauch

James L. Byrom

John J. Summersby

John J. Summersby has been elected vice president in charge of sales of Worthington Pump & Machinery Corp., Harrison, N. J. **Thomas J. Kehane** was made assistant vice president and general sales manager. **John P. McArthur** has been named manager of West Coast sales.

M. K. Brintlinger, Columbus, Ohio; **C. R. Brown,** New Haven; **R. B. Durfee,** Skaneateles, N. Y.; **C. R. Hecker,** Plainfield, N. J.; **H. A. Moffat,** Lakewood, Ohio; **J. P. Shotland,** New York; **R. L. Stephenson,** Detroit, and **J. W. Van Scoter,** Chicago, all field engineers, have been named district managers of The A. F. Holden Co., New Haven, Conn.

Alfons Alven has been named general sales manager of Rollway Bearing Co., Inc., Syracuse, N. Y. He was previously president of Bearings Co. of America, Lancaster, Pa.

Jack Stout has been named district manager of the new West Coast office of The H. M. Harper Co. in Oakland, Calif.

Jim Holland

Jim Holland, for twelve years sales manager of the Phillips Div. of American Screw Co., has been named sales manager of Camcar Screw & Mfg. Corp. (formerly Camcar Products Co.), Rockford, Ill.

A. J. Rinnander, formerly with the Chicago Pneumatic Tool Co., New York, has become a member of Harnischfeger Corp., Milwaukee. He will supervise field activities, Zip-Lift Hoist distributors and sales.

S. H. Fedan, manager of the Aeromatic propeller dept. of Koppers Co., Inc., has been named assistant to the sales manager of the company's Metal Products Division.

John G. Caley has been appointed district manager of the Mack Truck Co.'s Birmingham, Ala., direct factory branch. Previously he was with the Carley Trailer & Equipment Co. of America, and during the war was regional director for the Office of Defense Transportation in the Southeast.

Obituaries

Homer D. Heman, 73, vice president of the Ajax Mfg. Co., Cleveland, at the time of his retirement in 1948, died Aug. 31. He joined Ajax in 1901. Before becoming vice president, he served as general manager of Ajax.

Ralph W. Lashells, 52, president of the Bearing & Transmission Co., Findlay, Ohio, died Aug. 31. He was also president of Ohio Conveyor Co. and of the Buckeye Electric Co., of Findlay.

Walter W. McGrath, general manager of the Kenny Service Tools Co., Mogadore, Ohio, died Aug. 28.

Fred H. Albrecht, formerly with Lodge & Shipley Co., Cincinnati, died Aug. 27.

John L. Daly of the sales dept. of Combustion Engineering-Superheater, Inc., New York, died Aug. 16.

William E. Farrell

William E. Farrell, 79, founder and chairman of the Easton Car & Construction Co., Easton, Pa., died Aug. 22. He was an early pioneer in the field of industrial mechanized handling and an authority on the design and standardization of mine and industrial transportation equipment.

Business Items

Azed, Inc., a new corporation jointly owned by Poor & Co., Chicago, and the Acme Steel Co., Riverdale, Ill., has been formed to engage in the research, manufacture and sale of products and processes for all phases of the application and secondary treatment of zinc surfaces. Offices are in Chicago, laboratories at Riverdale and Waukegan, and the factory is at Waukegan.

Geometric Tool Co., New Haven, Conn., has appointed the George Worthington Co., Cleveland, as distributor in the Cleveland area.

Cleveland Graphite Bronze Co. has acquired the business and assets of Monmouth Products Co., manufacturers and distributors of automotive parts, to be operated as the Monmouth Products Div. Raymond Z. Oswald and Gilbert M. Salzman, Monmouth top executives, will head the division.

Interstate Welding Supply Corp., Cambridge, Mass., has established new headquarters at 216 Broadway.

Bevis Machine Co., Middletown, Ohio, has been purchased by Gardner Board & Carton Co., and will be operated as the Manchester Machine Co. with a capitalization of $250,000. James Boyd has been named president of the new company. Gardner will close its machine shop and transfer its activities and equipment to the new company.

Perfection Gear Co., Harvey, Ill., has purchased the American Stock Gear Co., Chicago, and will operate it as the American Stock Gear Div.

The Ready Tool Co., Bridgeport, Conn., has produced what is said to be the largest live center ever made. The 600 lb center incorporates seven sets of bearings. It was built for a special heavy duty lathe carrying 200,000 lb turbine rotor shafts.

E. W. Bliss Co.'s Detroit district sales office is now located in the Fisher Bldg., Room 2214.

Diebold, Inc., which will sell its No. 2 plant at Canton, Ohio, to the Truscon Steel Co., will consolidate all operations and machinery at the No. 1 plant in Canton. Consolidation of the plants will call for the expenditure of approximately $200,000 for new equipment and improvements.

Ryan Aeronautical Co. has received a $1 million contract for an additional quantity of jet-powered aerial target planes for the Air Force.

Another Special by Cross

Twelve Machining Operations *on Eaton Axle Shift Forks*

- ★ 87 pieces per hour at 100% efficiency.
- ★ Handles eight different part sizes.
- ★ Station 1, load and unload; Station 2, drill large and small holes in boss; Station 3, ream large hole, mill two bosses and slot in shank; Station 4, drill and ream two holes in fork, spot face and chamfer ends of large hole.
- ★ Fluid motor drive for power indexing.

THE **CROSS** CO.
DETROIT 7, MICHIGAN

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

Starrett® Announces

NEW FAST-KUT BAND KNIVES

for High Speed, Low Cost Precision Cutting of Soft or Fibrous Materials

Use these new Starrett FAST-KUT Band Knives for stack cutting, trimming, slicing or cut-apart operations on soft or fibrous materials. Their keen, slicing action cuts fast without waste, chips or dust — gives a smooth, finished cut without ragged edges. Available in a complete range of sizes in straight-edge, scallop-edge or wavy-edge types* — either single or double bevel—in coils of any length or cut to length and welded. Write for complete information. Ask for new FAST-KUT Band Knife Folder C, Starrett Hacksaw and Band Saw Catalog also free on request.

* Wavy-Edge Knives — ½", ⅝", 1", 1¼", 1½", 2" or 3" between waves. Scallop-Edge Knives — ½" scallop only.

USE STARRETT BAND KNIVES FOR BETTER, FASTER CUTTING OF...

- Boneless Meat
- Bread
- Cake
- Cardboard
- Cardboard Rolls
- Cellophane
- Cloth
- Cork
- Corrugated Board
- Dressmakers' Patterns
- Felt
- Fish
- Leather
- Paper
- Pie
- Sponge Rubber
- Tissue Paper
- Transformer Coils
- And Many Other Soft or Fibrous Materials

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Standard of Precision

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS • DIAL INDICATORS • STEEL TAPES
HACKSAWS • BAND SAWS AND BAND KNIVES
PRECISION GROUND FLAT STOCK

Buy Through Your Distributor

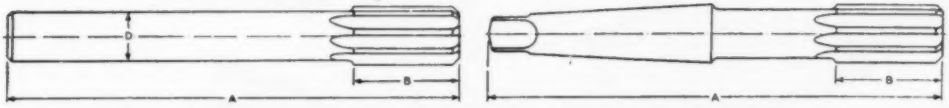
Make STARRETT Your Headquarters For All Precision Cutting

Starrett now meets all requirements for Hacksaws, Band Saws and Band Knives. Precision made by the World's Greatest Toolmakers in a new, modern building with latest facilities, advanced techniques and highest quality standards. Finest steel, scientific heat treatment plus precision grinding combine to make STARRETT your best buy.

THE L. S. STARRETT CO. · *World's Greatest Toolmakers* · **ATHOL, MASSACHUSETTS, U. S. A.**

Standard Reamers...III

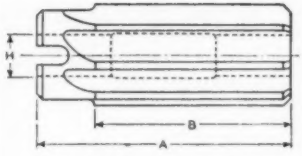
ROSE CHUCKING REAMERS (High-speed steel)



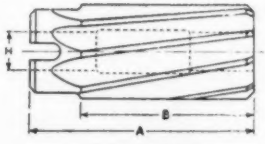
DIA.	LENGTH A	SHANK D	TAPER NO.	NUMBER FLUTES
1/8	3 1/2	7/8	—	4 to 6 incl.
5/32	4	1	—	4 to 6 incl.
3/16	4 1/2	1 1/8	—	4 to 6 incl.
7/32	5	1 1/4	—	4 to 6 incl.
1/4	6	1 1/2	1	4 to 6 incl.
9/32	6	1 1/2	1	4 to 6 incl.
5/16	6	1 1/2	1	4 to 6 incl.
11/32	6	1 1/2	1	4 to 6 incl.
3/8	7	1 3/4	1	4 to 6 incl.
13/32	7	1 3/4	1	4 to 6 incl.
7/16	7	1 3/4	1	6 to 8 incl.
15/32	7	1 3/4	1	6 to 8 incl.
1/2	8	2	1	6 to 8 incl.
9/16	8	2	1	6 to 8 incl.
5/8	9	9/16	2	6 to 8 incl.
11/16	9	9/16	2	6 to 8 incl.
3/4	9 1/2	5/8	2	6 to 10 incl.
13/16	9 1/2	5/8	2	6 to 10 incl.
7/8	10	3/4	2	6 to 10 incl.
15/16	10	3/4	3	6 to 10 incl.
1	10 1/2	7/8	3	6 to 10 incl.
1 1/16	10 1/2	7/8	3	6 to 10 incl.
1 1/8	11	7/8	3	6 to 10 incl.
1 3/16	11	1	3	8 to 12 incl.
1 1/4	11 1/2	1	4	8 to 12 incl.
1 5/16	11 1/2	1	4	8 to 12 incl.
1 3/8	12	1	4	8 to 12 incl.
1 7/16	12	1 1/4	4	8 to 12 incl.
1 1/2	12 1/2	1 1/4	4	8 to 12 incl.

SHELL REAMERS (High-speed steel)

DIA.	LENGTH A	HOLE H*	FITTING ARBOR NO.
3/4	2 1/4	3/8	4
13/16	2 1/2	1/2	5
7/8	2 1/2	1/2	5
15/16	2 1/2	1/2	5
1	2 1/2	1/2	5
1 1/16	2 3/4	5/8	6
1 1/8	2 3/4	5/8	6
1 3/16	2 3/4	5/8	6
1 1/4	2 3/4	5/8	6
1 5/16	3	3/4	7
1 3/8	3	3/4	7
1 7/16	3	3/4	7
1 1/2	3	3/4	7
1 9/16	3	3/4	7
1 5/8	3	3/4	7
1 11/16	3 1/2	1	8
1 3/4	3 1/2	1	8
1 13/16	3 1/2	1	8
1 7/8	3 1/2	1	8
1 15/16	3 1/2	1	8
2	3 1/2	1	8
2 1/16	3 3/4	1 1/4	9
2 1/8	3 3/4	1 1/4	9
2 3/16	3 3/4	1 1/4	9
2 1/4	3 3/4	1 1/4	9
2 5/16	3 3/4	1 1/4	9
2 3/8	3 3/4	1 1/4	9
2 7/16	3 3/4	1 1/4	9
2 1/2	3 3/4	1 1/4	9
2 9/16	4	1 1/2	10
2 5/8	4	1 1/2	10
2 11/16	4	1 1/2	10
2 3/4	4	1 1/2	10
2 13/16	4	1 1/2	10
2 7/8	4	1 1/2	10
2 15/16	4	1 1/2	10
3	4	1 1/2	10



STRAIGHT FLUTE

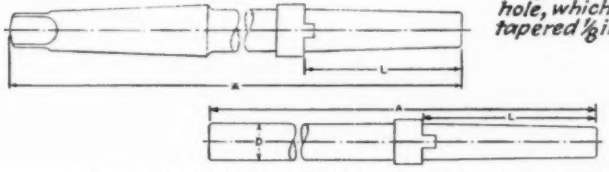


SPIRAL FLUTE

ARBOR DIMENSIONS

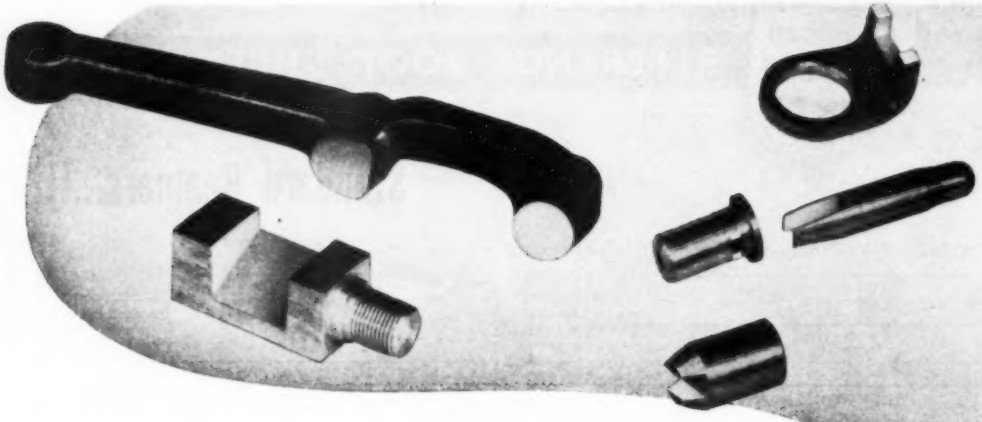
ARBOR NO.	LENGTH A	SHANK D	SHANK TAPER
4	9	1/2	2
5	9 1/2	5/8	2
6	10	3/4	3
7	11	7/8	3
8	12	1 1/8	4
9	13	1 3/8	4
10	14	1 5/8	5

ARBORS FOR SHELL REAMERS



* Large end of hole, which is tapered 1/8 in./ft.

Source: American Standard ASA B5.14—1949 published by the American Society of Mechanical Engineers



HIGH PRODUCTION THROUGH *Surface Broaching*

★ Cost per piece is of primary importance in the machining of all metal parts. Surface broaching is being used in many plants to produce work similar to these illustrations, with higher production per machine and lower tool maintenance cost than was possible with former machining methods.

We will be glad to work with you on the possibility of applying surface broaching to your work. Send blueprints of your parts and production requirements.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.
Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.
Continuous Type Machine. Made in 4 Sizes.
INVESTIGATE
Surface Broaching
FOR DIFFICULT MACHINING WORK

FOOTBURT SURFACE BROACHING

A TIME TESTED LINE OF MACHINE TOOLS

Chart for Estimating Cutting Time

BY TYLER G. HICKS

THE accompanying chart permits quick estimates of the time required for turning and boring work. It is based on the relation,

$$\text{Cutting time in min.} = \frac{\pi \times D \times L}{12 \times \text{sfpm} \times \text{Feed}}$$

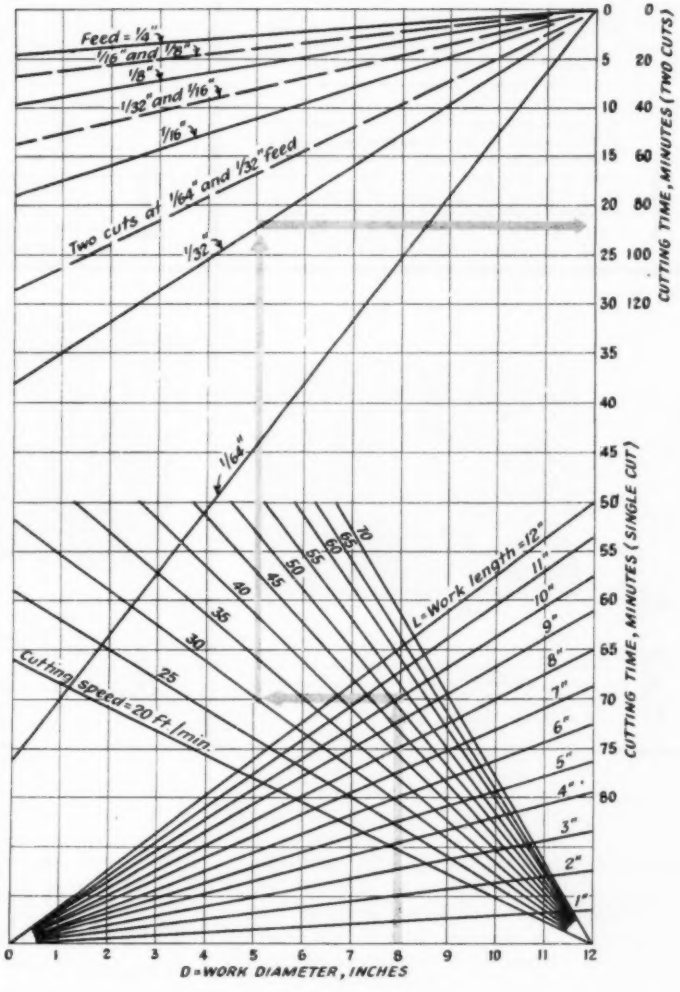
where D = work dia and L = work length in inches

Example: Determine the time required to take a single cut on a member 8 in. in dia by 10 in. long at 30 sfpm and 1/32-in. feed.

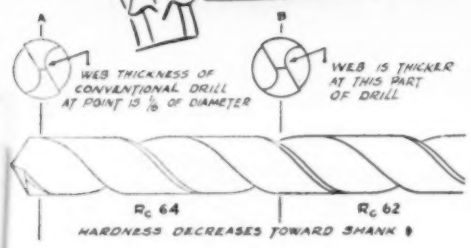
Solution: See dash line on chart. Enter the bottom of the chart at $D = 8$ in. and project vertically to the work-length curve, $L = 10$ in. From here move horizontally to the left to intersect the cutting speed curve for 30 sfpm. Then project vertically to the 1/32-in. feed curve and thence horizontally to the right. Read 22¼ min. on the inner time scale, as the cutting time for the job.

If two cuts are taken, say one at 1/64-in., the other at 1/32-in. feed, the dashed curve marked with the proper feeds is used with the outer time scale.

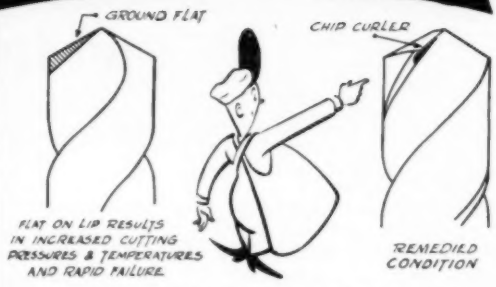
Where cutting speed exceeds chart values, solve the problem by a speed that can be divided evenly into the higher speed. Example: For 100 sfpm solve the problem using 25 sfpm, and divide the required time by four to obtain the actual time. For flange facing, use the mean diameter of the work when entering the chart.



Short drills solved a problem for *Stainless Sam*

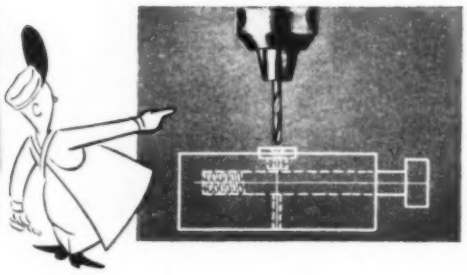

A
B
WEB THICKNESS OF CONVENTIONAL DRILL AT POINT IS 1/8 OF DIAMETER
WEB IS THICKER AT THIS PART OF DRILL
R_c 64
R_c 62
HARDNESS DECREASES TOWARD SHANK

1 A screw machine shop was having trouble with poor drill performance on thin-walled stainless steel parts. Stainless Sam learned the shop men were using shortened drills made from long ones. Since the web of the drill becomes thicker toward the shank, it was necessary to thin the web to reduce cutting temperatures. (Because of the thin wall of the part, heat could not be conducted away from the drill.)

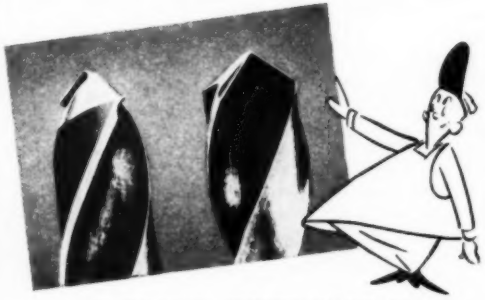

GROUND FLAT
CHIP CURLER
FLAT ON LIP RESULTS IN INCREASED CUTTING PRESSURES & TEMPERATURES AND RAPID FAILURE
REMEDIED CONDITION

2 When the web was thinned out, the helix angle of the drill was lost. There was *no chip curler at the lip.* The flattened drills then cut with a zero degree top rake angle instead of the approximate 10-degree angle recommended for stainless steel. Grinding in a chip curler remedied the condition.

The easiest and quickest way to avoid these troubles, Stainless Sam says, is to use only short drills made specifically for screw machine work.



3 Bushings should always be *short* when you are using a drill jig. This makes it possible to use a short drill. Removable bushings can be used if chip congestion in the bushing is a serious problem.



4 For the average machining job, Stainless Sam recommends that drills be backed out at intervals to relieve chip congestion. The general rule for automatic screw machine work is three to four times diameter of drill for first insertion, one to two diameters for second, and three-quarters for the third and fourth. Drawing shows groove that assists chip elimination on automatics.

If you are not using ARMCO Stainless Steel bars or wire, perhaps parts of your equipment or products could benefit by these rustless metals—often at *no increase in cost.* ARMCO Stainless resists heat and corrosion, adds strength and beauty to the products you make.

For complete up-to-the-minute information on drilling and other machining operations, write for a copy of the Armco booklet, "Machining of ARMCO Stainless Steels."

And remember, ARMCO Stainless Steel bars, wire and angles are available for quick delivery. Just write Armco Steel Corporation, 264 Curtis Street, Middletown, Ohio. Or call our nearest district office or ARMCO Distributor.

Export: The Armco International Corporation

ARMCO STAINLESS STEELS

ARMCO

Plain Washers

A proposed standard sponsored by the SOCIETY of AUTOMOTIVE ENGINEERS and the AMERICAN SOCIETY of MECHANICAL ENGINEERS

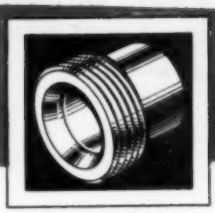
Bolt Size		Light				Medium				Heavy				Extra Heavy			
		I.D.	O.D.	Thick-ness	Gage	I.D.	O.D.	Thick-ness	Gage	I.D.	O.D.	Thick-ness	Gage	I.D.	O.D.	Thick-ness	Gage
0.060	0	5/64	3/16	0.020	25												
0.073	1	3/32	7/32	0.020	25												
0.086	2	3/32	1/4	0.020	25												
0.099	3	1/8	1/4	0.022	24												
0.112	4	1/8	1/4	0.022	24	1/8	5/16	0.032	21								
0.125	5	5/32	5/16	0.035	20	5/32	3/8	0.049	18								
0.138	6	5/32	5/16	0.035	20	5/32	3/8	0.049	18								
0.151	7	11/64	13/32	0.049	18	3/16	3/8	0.049	18								
0.164	8	3/16	3/8	0.049	18	3/16	7/16	0.049	18								
0.177	9	13/64	15/32	0.049	18	7/32	1/2	0.049	18								
0.187	3/16	7/32	7/16	0.049	18	7/32	1/2	0.049	18	1/4	9/16	0.049	18				
0.190	10	7/32	7/16	0.049	18	1/4	9/16	0.049	18	1/4	9/16	0.065	16				
0.203	11	15/64	17/32	0.049	18	1/4	9/16	0.049	18	1/4	9/16	0.065	16				
0.216	12	1/4	1/2	0.049	18	1/4	9/16	0.049	18	1/4	9/16	0.065	16				
0.242	14	17/64	5/8	0.049	18	5/16	3/4	0.065	16	5/16	7/8	0.065	16				
0.250	1/4	9/32	5/8	0.065	16	5/16	3/4	0.065	16	5/16	3/4	0.065	16	5/16	7/8	0.065	16
0.268	16	9/32	5/8	0.065	16	5/16	3/4	0.065	16	5/16	7/8	0.065	16	5/16	7/8	0.065	16
0.294	18	5/16	3/4	0.065	16	3/8	3/4	0.065	16	3/8	7/8	0.083	14	3/8	1 1/8	0.065	16
0.3125	5/16	11/32	11/16	0.065	16	3/8	3/4	0.065	16	3/8	7/8	0.083	14	3/8	1 1/8	0.065	16
0.320	20	11/32	11/16	0.065	16	3/8	3/4	0.065	16	3/8	7/8	0.083	14	3/8	1 1/8	0.065	16
0.372	24	13/32	13/16	0.065	16	7/16	7/8	0.083	14	7/16	1	0.083	14	7/16	1 3/8	0.083	14
0.375	3/8	13/32	13/16	0.065	16	7/16	7/8	0.083	14	7/16	1	0.083	14	7/16	1 3/8	0.083	14
0.4375	7/16	15/32	59/64	0.065	16	1/2	1 1/8	0.083	14	1/2	1 1/4	0.083	14	1/2	1 5/8	0.083	14
0.5000	1/2	17/32	1 1/16	0.095	13	9/16	1 1/4	0.109	12	9/16	1 3/8	0.109	12	9/16	1 7/8	0.109	12
0.5625	9/16	19/32	1 3/16	0.095	13	5/8	1 3/8	0.109	12	5/8	1 1/2	0.109	12	5/8	2 1/8	0.134	10
0.625	5/8	21/32	1 5/16	0.095	13	11/16	1 1/2	0.134	10	11/16	1 3/4	0.134	10	11/16	2 3/8	0.165	8
0.750	3/4	13/16	1 1/2	0.134	10	13/16	1 3/4	0.148	9	13/16	2	0.148	9	13/16	2 7/8	0.165	8
0.875	7/8	15/16	1 3/4	0.134	10	15/16	2	0.165	8	15/16	2 1/4	0.165	8	15/16	3 3/8	0.180	7
1.00	1	1 1/16	2	0.134	10	1 1/16	2 1/4	0.165	8	1 1/16	2 1/2	0.165	8	1 1/16	3 7/8	0.238	4
1.125	1 1/8					1 3/16	2 1/2	0.165	8	1 1/4	2 3/4	0.165	8				
1.250	1 1/4					1 5/16	2 3/4	0.165	8	1 3/8	3	0.165	8				
1.375	1 3/8					1 7/16	3	0.180	7	1 1/2	3 1/4	0.180	7				
1.500	1 1/2					1 9/16	3 1/4	0.180	7	1 5/8	3 1/2	0.180	7				
1.625	1 5/8					1 11/16	3 1/2	0.180	7	1 3/4	3 3/4	0.180	7				
1.750	1 3/4					1 13/16	3 3/4	0.180	7	1 7/8	4	0.180	7				
1.875	1 7/8					1 15/16	4	0.180	7	2	4 1/4	0.180	7				
2.000	2					2 1/16	4 1/4	0.180	7	2 1/8	4 1/2	0.180	7				
2.250	2 1/4									2 3/8	4 3/4	0.220	5				
2.500	2 1/2									2 5/8	5	0.238	4				
2.750	2 3/4									2 7/8	5 1/4	0.259	3				
3.000	3									3 1/8	5 1/2	0.284	2				

I.D. Tolerance ±.005
O.D. Tolerance ±.010

I.D. Tolerance ±.010
O.D. Tolerance ±.010

In the customer's own words...

Here's how New Britains produced a better method



Part Machined – 3/4" Union Female End

	OLD METHOD	NEW METHOD
TYPE MACHINE & MODEL	[redacted] Hand Screw Machine	New Britain Model 656 Automatic Chucker
PRODUCTION PER 8 HR. DAY	375	1400
INCREASE IN PRODUCTION	—	400%
OVERHEAD	75% of cost per piece	50% of cost per piece

". . . we are now making the male end on the Model 656 too, and converting our New Britain Model 467 to second operation work. We also completely machine a union coupling nut on a specially adapted Model 675 New Britain with comparable savings. We are also interested in getting a quotation on a Model 88 New Britain Automatic."

CATAWISSA VALVE & FITTINGS CO.

C. L. Davis
Plant Engineer

THE JOB: Eleven operations are performed by a six spindle New Britain Automatic, in facing end, chamfering both sides of thread diameter, drilling through piece and finishing seat, turning thread diameter and threading O.D.

There's a better method to be found in every shop — dozens of them in most.

Find them and you have the surest way to keep your costs at competitive levels. The New Britain sales engineer in your area can help you with them. Why not give him a shot at some of the problem pieces you make? Write us direct for "IT CAN BE DONE" — cost histories on many actual pieces. It's packed with production ideas.

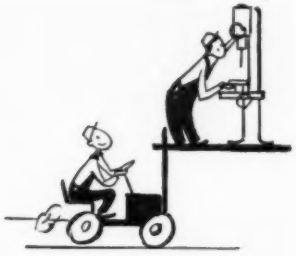
NB

NEW BRITAIN
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

549HG1

TALKING SHOP



Flexible Shop

NORTHWEST METAL PRODUCTS CO., Seattle, has its punches and drill-presses set so they can be moved by forklift truck. Any foreman can order a move, which takes 10 to 15 min . . . Ten special home-made machines turn out 2000 fpm of finished downspout. Each is a complete fabricating unit, starting with sheared sheet at one end and delivering downspout at 1/7 the usual cost because of reduced handling. Thus the company does not fabricate for stock, but produces orders on a 24-hr custom basis, with only elbows and similar parts stocked.

More Power

A MAJOR automotive producer is reviewing materials and methods, expects review to result in the most sweeping process changes in company history. Entirely new materials and machines are expected to come out of it. With tooling improvement, these steps are the direct route to cut manufacturing costs. The tool engineer is expected to have his greatest opportunity in the months to come.

Automation (auto feeding and ejecting) and predetermination of optimum machining rate and method in advance of equipment selection are among specific steps to be taken. Studies equivalent to G. E.'s "Value Analysis" (*A.M.*, July 14) will be undertaken of parts before production. Improved use of manpower is anticipated—reduction of handling and close-watch operation by applying transfer machines, automatic feeds, progressive dies, welding and heat-treating right in press or machining lines and the like.

So, again, multiplying mechanical horsepower per man is the path to cost savings.

Close Reaming

FIRST all-aluminum bridge on this continent is being built by Dominion Bridge Co. for Aluminum Co. of Canada and will be erected at Arvida, Quebec. Required close control over rivet-hole sizes in aluminum members is being handled with three-flute reamer drills, checked after grinding with a new type of V-block-anvil micrometer.

Color Identifies

A MACHINE-TOOL PLANT in England making several different types of machines has solved the difficulty of segregating jigs and fixtures by painting them in different colors. All fixtures used on shapers, for example, are painted blue and are stored in blue-painted racks.

Daffynitions

CLASS REUNION: mixing old grad and Old Grandad . . . INDIAN TREATY: ughreement . . . CARPENTER: man with chip on shoulder . . . MARRIAGE: when a woman shifts from searching for a husband to wondering where he is . . . NYLONS: two feet of girl; four miles of thread . . . GYMNASIUM: where bars, not customers, are horizontal . . . EGOTISM: I ailment . . . COMMUTER: man who spends his life rushing from and to his family . . . HICK TOWN: one that's proud of traffic congestion . . . PRETZEL BENDER: guy who doesn't know which way to turn . . . JUVENILE DELINQUENCY: new name for what we used to do . . . GLOBE TROTTER: itchy feet and roamin' nose.

Feed, Not Thread

IN *A.M.* July 14, we showed an ancient gear cutter on page 123. But we apparently misinterpreted Mr. Colvin's notes on one point. He hastens to point out that the 1-in. belt on the old lathe at right didn't drive the gear for thread cutting, but only drove the feed rod through the feed rod at the bottom of the gear train. Mr. Colvin used such a lathe 60 years ago during his apprenticeship. Says Howard Rich, Jr., of Lynd-Farquhar, Boston: "Actually, this belt shown in the illustration was not used for cutting various-pitch threads and served to furnish three feed rates for turning and boring. A quill carrying a large and small gear was keyed to a bushing connected to the lower cone. A slotted yoke attached to the feedscrew bracket permitted the quill to be changed, end for end, providing a total of 6 feed changes. All threads were cut on this F. E. Reed lathe by means of loose change gears.

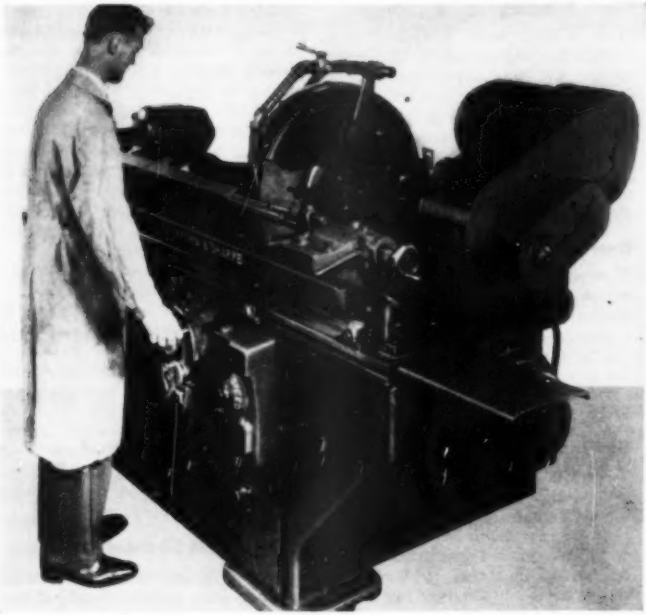
"I owned one of these lathes for a number of years and found it quite satisfactory in spite of its age. It was equipped with cast-iron spindle bearings which became glass-hard over a period of many years use. This fact was determined when I once thought it might be possible to rescrape the spindle bearings and found that the scraper would merely skate over the surface."

Plane—and Straight

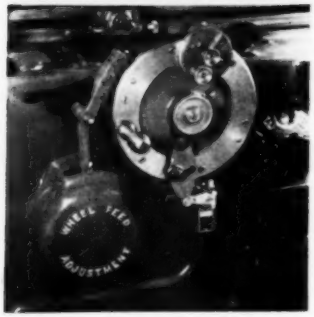
LARGE planer beds, particularly jointed ones, are notoriously difficult to keep straight. They tend to develop a certain amount of bow when viewed in plan. A British planer manufacturer has solved the problem by sinking 4-in. square steel bars, 18-in. long, into the foundation adjacent to the holddown bolt lugs. Ends project about 4 in. above the surface and are tapped for a large capscrew whose head bears on the side of the machine. After the bed has been leveled it is checked for straightness by a collimator, the holddown bolts eased off, and the jackscrews tightened or loosened as required to force the bed into alignment. By this means, an 80-ft. bed can be made straight within 0.003 in.

Original method of correcting bow was by scraping, and an 80-ft. bed required approximately 1000 man-hr. This is now reduced to 250 man-hr. On plain, single-piece beds, scraping has been reduced from 200 to 70 man-hr.

New Shop Equipment



1 *Automatic Cycle and Spark-Timing Arrangement, for Brown & Sharpe Plain Grinding Machines automatically controls sparkout time and, operating at a predetermined rate, permits fast economical grinding. Less-experienced operators may be employed, as the sparkout time, normally a matter of experience, is now accomplished automatically. Elimination of idle or non-productive time is accomplished by the continuous smooth infeed sweep of the handwheel. The grinding wheel is brought into direct contact with the work and initial grind is provided before engaging the cross-feed pawl, after which the cycle is completed automatically. The cycle is not confined to plunge-cut grinding only. It can be used with reciprocating table using the normal amount of sparkout time which an operator would allow for traverse grinding were the automatic cycle not available. Wheel wear and wheel truing are taken care of in the usual way.*



2 *Cross-feed handwheel carries the feed limit-switch cam, set by loosening the clamping bolt and moving it directionally to synchronize the handwheel and switch. Operator places the piece to be ground in position. Disengaging the feed pawl, he makes an oscillatory movement of the handwheel, then engages the pawl, providing automatic control. Manual control for small lots is provided by loosening the bolt on the feed limit-switch cam and shortening cam length*

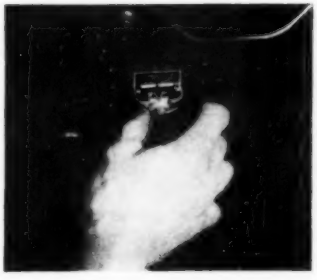
Size and Sparkout Control Makes B&S Plain Grinders Automatic

Two automatic cycle arrangements for cylindrical grinding machines reduce grinding costs by reducing machine idletime and requiring less operator attention. By eliminating manual control, they minimize spoiled work. Simplification of setup and operation permits the grinding of even small lots with greater accuracy at less cost.

Feature of the two devices is the method of bringing the wheel into direct contact with the work, while the size control is in operation. This allows greater tolerances in previous turning operations and results in practically full-time grinding. There is no need to favor the high limit of turning tolerances in setting the control.

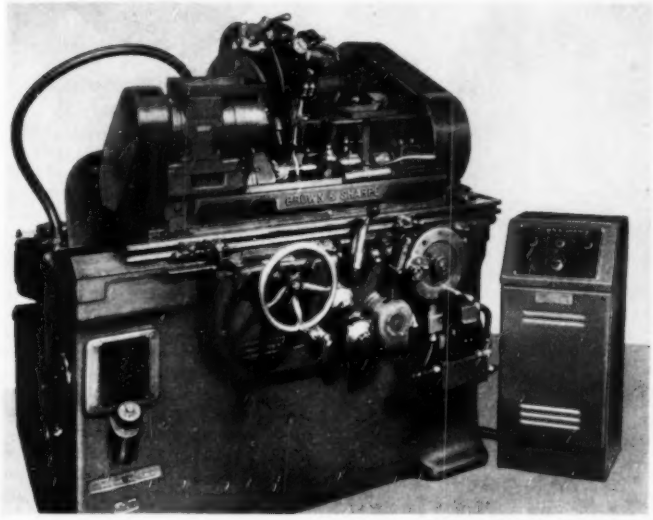
Known individually as the automatic cycle and spark-timing arrangement and the automatic cycle and sizing arrangement, both will provide the usual required accuracy of plain grinding machines, plus the advantages of automatic control and operation.

Brown & Sharpe Mfg. Co., Providence 1, R. I.

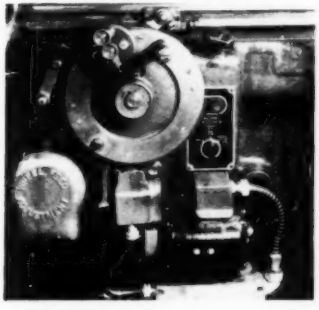


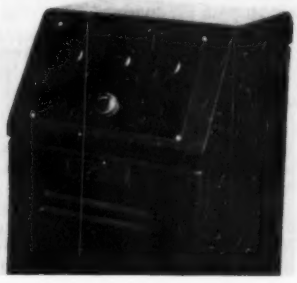
3 *Sparkout time from 2 to 180 sec. is adjusted by turning graduated knob, also possible while the machine is in operation. Signal light indicates that spark-timing arrangement is in operation*

Materials and Parts



4 *Automatic Cycle and Sizing Arrangement automatically sizes from the work. The operator brings the wheel into direct contact with, then places the gage on, the work. Simultaneously the automatic cycle is started by depressing the special tripper arrangement on the gage. This cannot be started accidentally, and the trigger arrangement insures against faulty operation from gage disturbances as it is being placed on the work. The cycle switches from coarse feed to fine feed by means of a predetermined setting of the work sizing gage, as the finish size is approached. Upon attaining finished size, the wheel slide is withdrawn from the work, the coolant shut off, and the headstock stopped—all automatically. Transition from coarse feed to fine feed may be attained from 0.001 in. to 0.003 in. before reaching the finished size. There is no need to compensate for wheel wear as the gage sizes from the work. Turning the selector switch on the panel to the position marked "No Automatic Sizing" leaves the standard machine for short-run lots*





5 *Selector Knobs will vary, with accuracy, the work diameter reduction per revolution of the headstock, from 0.0002 in. to 0.0001 in. in coarse feed and 0.00005 in. to 0.0001 in. in fine feed. The test lights simplify the gage setting in conjunction with the master. Variable-speed motor driving the cross-feed handwheel is controlled by the gage which, upon reaching finished size, causes the motor to withdraw the wheel slide, shuts off the coolant, and stops the headstock*

...INCLUDING

Tapping machine, 6 or 8 spindle, is semi-automatic for tapping couplings or nuts. Spindles have 8-in. travel.....page 150

Milling machine with automatic bar feed ejects parts as bar feeds. Cutting cycle of machine is automatic.....page 151

Pipe threader has rotating chuck which grips when rotating in either direction. Chuck grips and releases work instantly...page 152

Cutting solution for metal disintegrators is said to increase cutting speed 2 to 5 times...page 156

Precision switch can be adjusted by user to operate clockwise, counterclockwise, or in both directions.....page 160

Tooth gages have rack-type teeth so that checking approximates method by which gear teeth are generated.....page 164

Automatic follower can be connected to head or knee of milling machine. Odd-shaped forms can be turned out with follower on production basis.....page 166

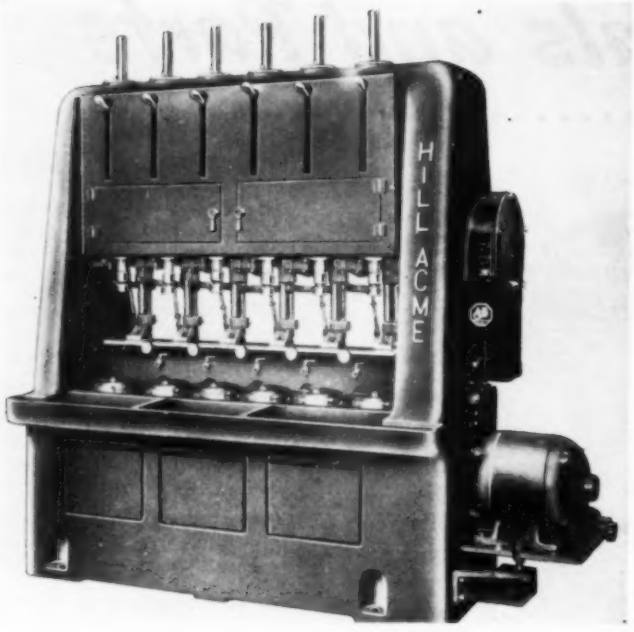
NEW BULLETINS for your Shop Library include a 32-page catalog describing more than 100 regulators for welding, cutting, and other processes....after page 228

...and in October 6

Roll-duplicating lathe is said to reduce machining time on rolling mill shape rolls from 50 to 85%.

Multiple-spindle drillhead is adjusted by changing drill pattern plate.

Hydraulic grinder mounts both external and internal spindles. Automatic internal wheel guard protects operator during loading and grinding.

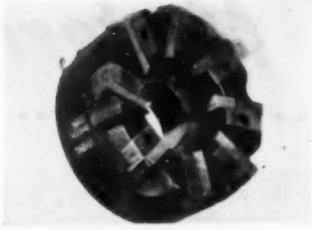


Semi-Automatic Tapping Machine Will Handle Couplings or Nuts

This semi-automatic tapping machine is applicable for tapping couplings or nuts. It is built in 6- and 8-spindle models and standard sizes of 1 and 2 in. Larger sizes are built in 4- or 6-spindle design. Working parts are inclosed. The Acme Model XC-W coupling tappers have integral designed housing and truss mounted on box-type base. Spindles are splined and independently operated by a worm drive mounted on anti-friction bearings, housed and running in oil.

Each spindle is equipped with a worm cam which provides quick return of spindles to their upper positions. Spindles have 8-in. travel. Scroll-type, self-centering, air-operated chucks are controlled by valves automatically operated by the vertical movement of the spindles. Acme tapping machines are designed for constant-speed motor drive through multiple V-belts driven by a general-purpose motor of suitable horsepower for the desired number of spindles on the machine.

Acme Machinery Div., Hill-Acme Co., 4533 St. Clair Ave., Cleveland, Ohio

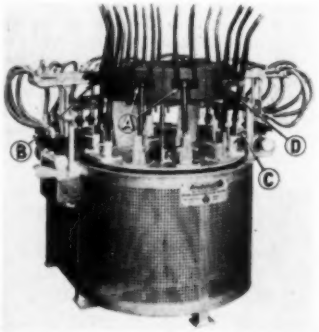


Solid Carbide Milling Blade Backed by Serrated Steel

This milling-cutter combination combines the stock removal qualities of brazed and serrated blade-tipped cutters with the economical regrinding features of the solid carbide bladed face mills. It consists of three pieces. A large carbide tip, a serrated steel backing piece, and a hardened tool-steel serrated wedge. The wedge is lipped on its outer side to provide positive resistance to feed thrust on the blade. It is also secured by a locking screw.

The wedge behind the blade eliminates cutter body damage in the event an accident breaks the blade. If the wedge is damaged it can be replaced by stock parts. By providing a steel extension behind the tip, up to 90% of the carbide can be consumed before the blade needs to be replaced.

Viking Tool Co., Shelton, Conn.



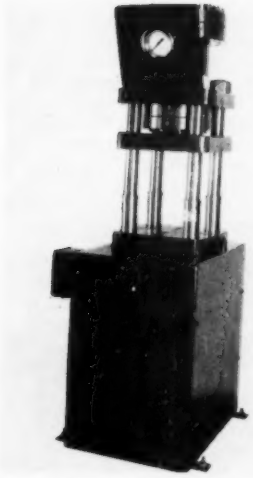
AUTOMATIC RADIANT GAS-BURNING machines give fork assemblies total heat exposure of 12 sec at 1750 F. Posts supporting the assemblies during the six-station brazing cycle can be adjusted quickly to accommodate a range of bicycle fork legs. The machine consumes 210 cu ft of 1000 btu natural gas per hour. *A*, assembled forks in position for cycle; *B*, first brazing burner station; *C*, device tripping fork into unloading position; *D*, fork ready for unloading.—*Selas Corp. of America, Erie Ave. and D Street, Philadelphia 34, Pa.*

Armco Stainless Steel Hardens at Low Temperature

Armco 17-4-PH stainless-steel alloy has high hardness and strength, excellent corrosion resistance, good fabrication characteristics, and requires only 850 to 1000 F hardening treatment.

Corrosion resistance of the alloy is superior to that of standard hardenable alloy and approaches that of 18-8. Heating the annealed material to approximately 900 F. for an hour and air cooling gives it high tensile and yield strength and Rockwell C hardness values of 40 to 45. Because only an easily removed surface discoloration is produced in the precipitation hardening of the alloy, parts can be finish machined before hardening. This can be readily hot-forged and has good machining and welding properties. It is available as bar stock or wire either annealed or hardened. A wide range of applications for this alloy is indicated.

Armco Steel Corp., Middletown, Ohio.

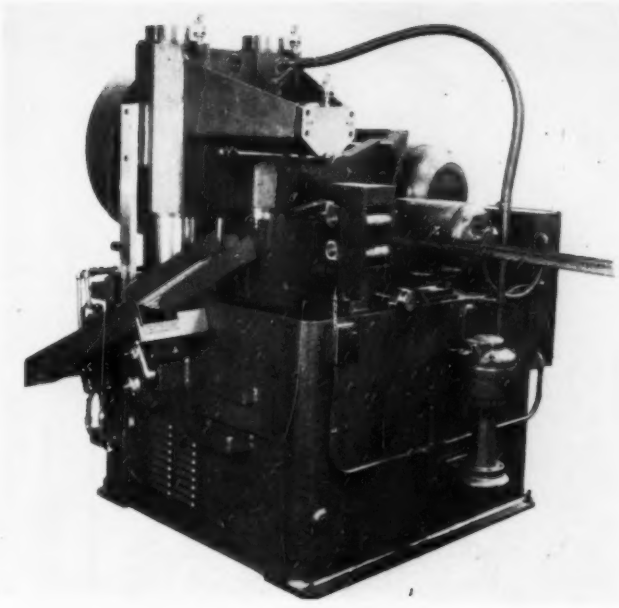


Self-Contained 50-Ton Drawing Press Features 12 x 12 in. Opening

Engineered for accurate drawing and forming of metals, this press has a 10-in. stroke, advanced speed of 120 ipm, and pressing speed under full load of 7½ ipm. Downward acting, it can be supplied with air or hydraulic cushions and can be built on order to capacity of 200 tons.

The press stands 6 ft high, occupies an area of 24 x 30 in., and weighs 1600 lb. The pressure dial is tilted forward for accurate readings.

M & N Machine Tool Works, Inc., Allwood, Clifton, N. J.



Kent-Owens Milling Machine Has Automatic Bar Feed

Automatic bar-feed machines for cutting off or multi-milling operations. Bar is placed in fixture and operation is as follows: The head, which carries the cutter travels in a down direction until the cutter approaches the parts to be milled or cut off. At this point head automatically goes into feed, feeds until the part is cut off or milled then reverse and returns in rapid traverse. During reverse stroke finished parts are automatically ejected and the bar is moved into place so that the next part can be milled. Operation is continuous until bar is used up.

Kent-Owens Machine Co., Toledo, Ohio

Wendt-Sonis End Mills Provide Extra Body Strength

These tools are available in styles for machining all types of steel, nonferrous materials, and cast iron. Shanks are especially heat-treated for greater strength and rigidity. Cutting edges are diamond lapped.

This line of tools is manufactured in straight and tapered shank styles with straight and right- or left-hand flutes. Sizes range from ¼ to 2 in.

Wendt-Sonis Co., Hannibal, Mo.

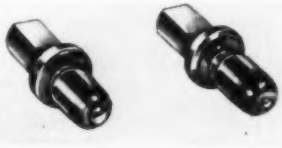
Light-Weight Scarfing Torch Made In 46-, 52-in Lengths

The Airco scarfing torch has a gas capacity of 5000 cfh at 100 psi, a flow rate permitting high output per man hour. Constructed of stainless steel, monel, and aluminum, the torch weighs 6 lb. Wear ribs on both sides of the type-304 stainless steel torch head are designed to increase the work life of the torch.

The torch is of the two-hose type with a triangular tube arrangement and is available in 46- and 52-in. lengths. A dual internal lever system makes possible independent starting of this device prior to the application of scarfing oxygen.

Two new style scarfing tips are available for this torch. Style 211 on the acetylene scarfing tip has flared oxygen orifices to obtain a wider kerf. Style 117 is the same tip available for use with natural gas. Both tips are available in sizes 17 and 18.

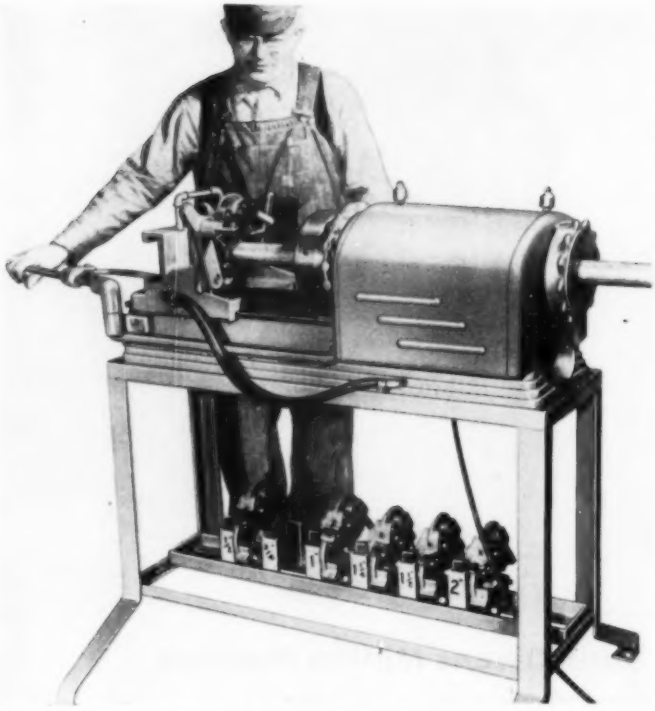
Air Reduction, 60 E. 42nd St., New York 17, N. Y.



Steel Ball Penetrators for Hardness Testing are Interchangeable

These penetrators are available in 1/16, ⅛, ¼ and ½ in. sizes, and can be used in all makes of Rockwell testing machines. Clark interchangeable ball penetrators are made of hardened steel, ground to precise roundness, providing smooth even penetration that is said to assure unusually accurate readings.

Clark Instruments Inc., 10200 Ford Road, Dearborn, Mich.



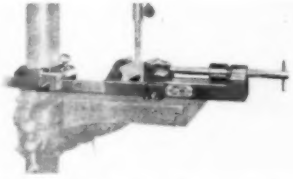
Mobile Threader Cuts, Reams, And Threads Pipe to 2-in. Dia

The Peerless Threadfast machine can cut, ream or thread pipe to 2 in. dia and thread solid rounds to 1½-in. dia. It is equipped with a new type Roto-Lok wrenchless chuck which, in effect, is a rapid-acting rotary vise designed to instantly grip and release the work. This chuck may be used for right or left-hand rotation, operating equally well in either direction.

Pipe ranging in diameter from ⅛ to 2 in., and bolts from ⅜ to 1½ in. dia can be placed through the rear centering unit, and the Roto-Lok wrenchless chuck. It is unnecessary to stop the machine to reposition pipe. After a thread is cut and the diehead clamp released the pipe is easily and quickly removed by hand. The carriage assembly is fed forward on replaceable steel ways by a manually-operated hand lever. The machine base is equipped with a removable drawer-type, self-draining chip pan. Directly beneath this pan is an oil reservoir with ample capacity for cutting oils. A gear-operated vane-type pump carries the oil from the reservoir to the diehead.

All dieheads used on the Threadfast machine are free-floating units permitting immediate and correct chaser contact. The diehead is opened and closed by a hand-operated toggle clamp. Fixed length, monotype, high speed steel chasers are used. Single chasers are replaceable should they be broken or worn.

Peerless Machine Co., 1600 Junction Ave., Racine, Wis.

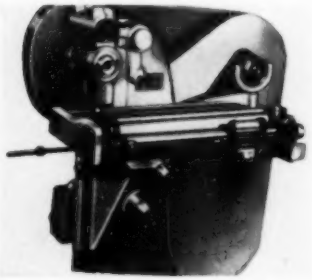


Universal Col-Vise Clamps Holds Work for Drill Press Operations

The Col-Vise clamps to the column of single or multiple spindle drill presses. Position of the vise is adjustable both angularly and radially and the entire device can be swung clear when necessary. The vise has 1½- x 4-in. jaws and the maximum opening of 6 in.

Models of this vise to fit drill presses with either stationary or movable tables are available. Column diameters of 1-7/16 through 3-29/32 in. can be accommodated.

Universal Vise & Tool Company, Parma, Michigan.

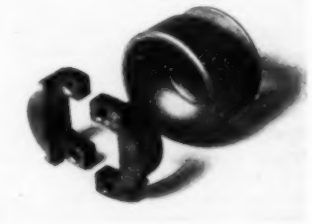


Air-Hydraulic Milling Machine Has 18-in. Longitudinal Table

The Air-Hydraulic No. 1 feed milling machine is for high-speed semi-automatic production. Table travel speed is adjustable in both directions, and cutting speed is infinitely adjustable.

The pneumatic table feed automatically provides rapid approach, adjustable feed, and rapid return. An air cylinder operating against the hydro-check valve is designed to insure a smooth cut.

The United States Machine Tool Co., Cincinnati 16, Ohio



High Friction Clutch Parts Made of Sintered Metal

The cup and flange of this clutch are made of an iron-base powder mix, while the brake shoes are made of a leaded iron copper material. The metal powder friction surface, which is the inside of the cup, has frictional properties, said to be most advantageous for use on fractional horsepower motors. Bearing surface under the pulley is permanently lubricated.

The Wel-Met Co., Kent, Ohio.

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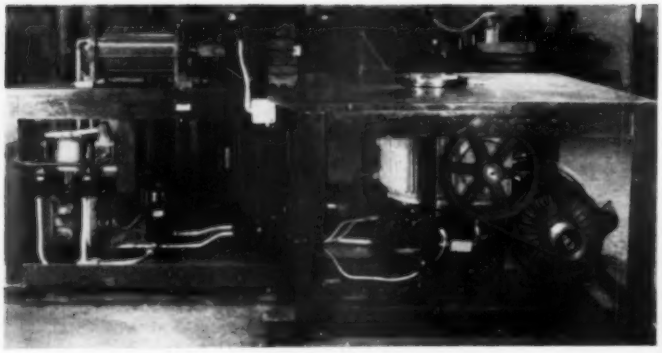
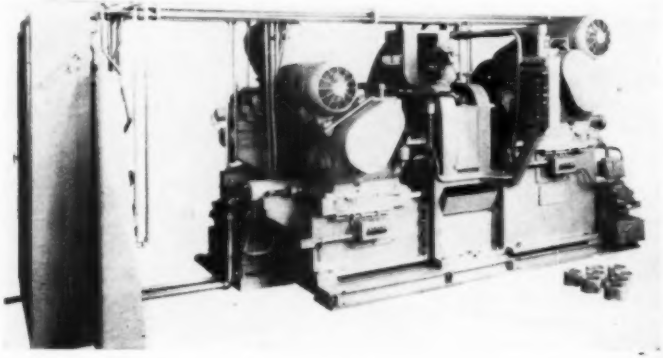


Hancock Power Bender Cycle Is Manual or Automatic

Basic operating components of the Hancock power bender are a rotary fixed drive and a pressure cylinder arrangement for bending work to the shape of the fixture, as the fixture revolves. The machine has all electric controls in both manual and automatic cycle operations. A motorized self-contained standard speed cone-drive reducer makes it possible to alter speed and torque by an interchange of speed reducers and motor shaft.

Variations of the bender to meet individual requirements as to operating speed, torque capacity and size of work to be handled are provided for. The machine pictured is driven by a 15-hp, 1200-rpm motor and has a torque capacity rating of 44,000 in-lb. Work handled by the machine includes metal moldings, tubes, and frames. It forms intricate bends at a high production rate.

Hancock Tool & Die Corp., 17065 Fullerton Ave., Detroit 27, Mich.



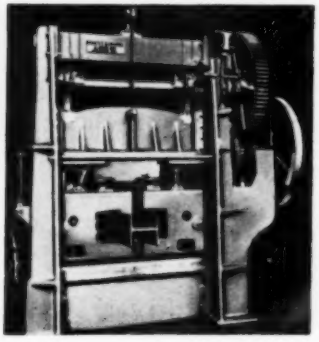
Hydraulic Feed Machine Reams Chamfers, Taps Couplings

Moline MR131 special two-way, four-unit, horizontal, hydraulic feed machine tapers—reams, chamfers, and taps a variety of sizes of pipe couplings. Clamping jaws can be installed in the fixture to hold 2½-, 3-, or 4-in. pipe couplings. A six-stationed, manually-operated, trunnion-type fixture holds the work. Jaws of suitable dimensions are inserted in the clamping vices for holding each size of pipe coupling.

Reaming and chamfering are performed by a combination tool with dwell for chamfering. Tapping units advance hydraulically to work and go into lead-screw feed for tapping. Collapsing taps are provided and allow rapid hydraulic withdrawal of taps from work.

Floor area occupied by the entire machine and control panel assembly is approximately 7 ft 10 in. by 15 ft 4 in. Approximate overall height is 6 ft 10 in.

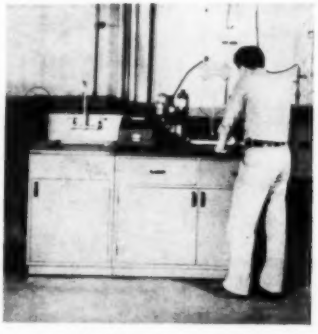
Moline Tool Co., Moline, Ill.



Beatty Machine Punches All I-Beam Flanges in One Pass

Designed for use on Beatty Guillotine Punch, this adjustable set of flange punch tools punch all four flanges of I-beams and wide flange beams in one pass. The new tools include a punch-carrying unit which adjusts horizontally from 8 to 30 in. accommodating beams of various sizes. The punch and die units adjust vertically to meet gage line requirements.

Beatty Machine Mfg. Company, Hammond, Indiana.



TEST BENCHES can be had in any length and a variety of designs by joining prefabricated steel units. Eighteen different all-steel units are available including drawers, cupboards, sinks, tables, storage cases, etc. Units are 2, 3, 4, or 5 ft in length, and have plastic-impregnated stone working surfaces—*Fisher Scientific Co., 714 Forbest St., Pittsburgh 19, Pa.*

This Nicholson continuous ad is one of many appearing monthly in *The Saturday Evening Post*.

STEADY advertising and good distribution can help a product gain the top, but only consistently *high quality* and *good value* can keep it there. That's where Nicholson and Black Diamond files have been for many years—to make Nicholson the world's largest file manufacturer.

High quality in these world-famous files is a combination of a number of things: Expert design (always *The right file for the job*), high-grade file steel made to our own specifications, even-surfaced blanks and accurate cut, uniformly correct hardening . . . these are major features assured through rigid controls and check-ups at every stage of production.

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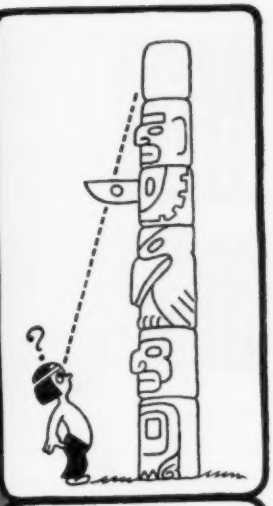
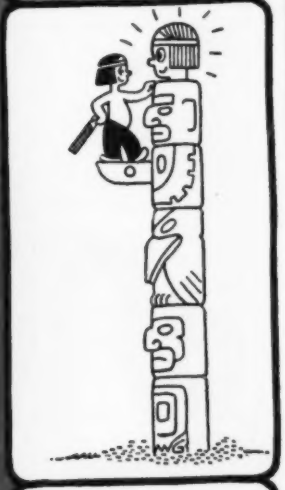
NICHOLSON FILES FOR EVERY PURPOSE

WHAT MADE THEM "LARGEST SELLING"?

NICHOLSON SUPERIOR—curved tooth file for metals up to hardness of commercial annealed tool steel.

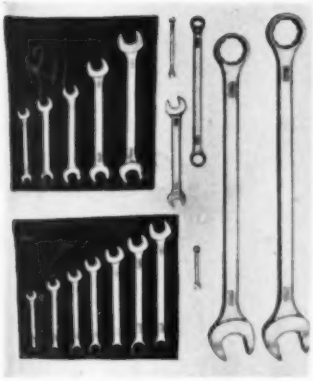




a Nicholson file for every purpose

World's largest selling file brands — available at good hardware, implement and industrial-supply dealers.

NICHOLSON U.S.A. and BLACK DIAMOND TRADE MARK



Proto End Wrenches And Sets Added

Two new sets and six end wrenches add to the versatility of the Proto Wrench Line. Of the end wrenches two are the open-end type. No. 3016 fits No. 2- and No. 3-small and No. 4-large American Standard nuts. No. 3033 fits 5/16- and ⅜-in. American Standard heavy nuts and U.S.S. bolt-heads and nuts. No. 1133 is a double-end 12-point box type. The rest are combination box and open-end.

Set No. 3000N, with five open-end wrenches, provides sizes from ⅜ to ⅞ in. Set No. 1200H with seven combination box and open-end wrenches has opening sizes from ⅜ to ¾ in.

Plomb Tool Co., Los Angeles 54, Calif.

Compact Jeep Fork Truck Has 33-in. Wheelbase

Designed to meet demand for extremely compact maneuverable chassis to operate on small elevators or in congested areas, this fork truck has overall length when carrying a 48 in. long pallet load of 103 in. In spite of reduced size it is said to retain full rated capacity of the stand-and Jeep.

Mercury Manufacturing Co., 4114 South Halsted St., Chicago 9, Ill.

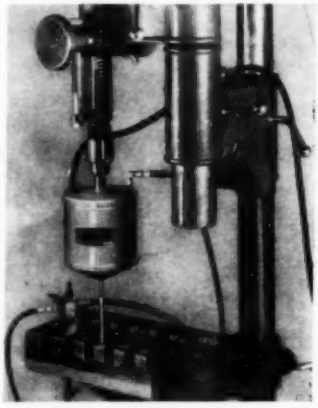
Gerotor Cushion Cylinders Employ Displaced Fluid

Series 100 cylinders of 150-psi air, and 300-psi oil capacity are standard cylinders employing cushion units. Design provides effective cushioning of the piston stroke by compression of the displayed air or fluid. A cushion plate attached to the cylinder cover blocks off the flow of exhaust air or fluid which, displaced by the piston movement, is compressed and metered out through adjustable needle valves. This cushions the piston during the remainder of the stroke.

One needle valve, located in the blind end cover, controls the speed of the cushioning stroke when the piston rod is retracting. The other needle valve, located in the rod end cover, controls the speed of cushioning stroke when the piston rod is extended.

Gerotor cushion air cylinders may be obtained with cushioning on both ends of the cylinder, or with cushioning on either end only. Four sizes in which cushioning strokes may be obtained are 1½, 2, 2½, 3, 4½, 6, 8, 10 and 12 in.

Gerotor May Corp., Baltimore 3, Md.

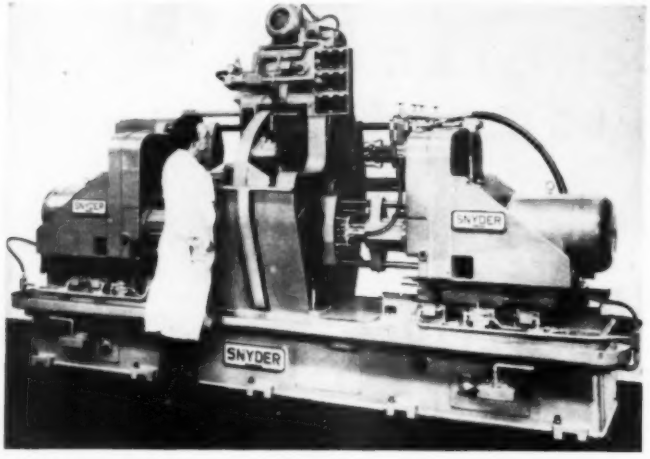


Elox Cutting Solution Cuts Cutting Time

Developed for use with metal disintegrators, this solution is said to speed up broken part removal and hole cutting from 200 to 500%. According to the manufacturer, 30 min. is the average time required to remove ¼-20 high-speed broken taps with an Elox Model K machine and water. With Elox cutting solution concentrated in correct proportion the average cutting time is reduced to 10 min.

The solution is said to facilitate smoother and more precise cutting on expensive tools and dies. Power consumption and wear and tear on equipment are greatly lessened and manhours can be saved with this solution, according to the manufacturer.

Elox Corporation, 740 N. Rochester Road, Clawson, Mich.



AUTOMATIC CYCLING machine for drilling, countersinking, rough boring, and semi-finish reaming automotive transmission parts is mounted on a welded steel base, thoroughly normalized for rigidity. Floor space required is 81 x 174 in. Production rate is 75 cycles per hour, at 80% efficiency. The machine is equipped with a Snyder four-station Geneva-operated trunnion.—*Snyder Tool & Engineering Co., Detroit, Mich.*

DETROIT BROACH ENGINEERS WILL *Cut Your* PRODUCTION COSTS *5 ways*

NEW BROACHING APPLICATIONS:

1 APPLICATION ANALYSIS—Detroit Broach application engineers will help you to develop new broaching applications in your production processing. Their recommendations are accompanied with actual production data and costs to help you determine your savings beforehand.

PRESENT BROACHING APPLICATIONS:

2 INCREASED PRODUCTION—Detroit Broach will study your present broaching applications to determine means of increased production from them. This is often possible through improved work-clamping, multiple loading of work on each machine slide and many other ways.

3 INCREASED WORK LOAD—Often, Detroit Broach can show manufacturers how they can increase the work load on their broaching machines through the design of universal-type tooling that is quickly convertible to more than one part. This can make it economical to broach a number of low-production parts whose sum production would keep equipment busy full time.

4 INCREASED BROACH LIFE—Often tool life can be increased by changing chip load, length, hook, etc., of broaches. In addition, the steel used and its heat-treatment are extremely important in tool life. Detroit Broach engineers will study your broaching applications and make recommendations for these changes wherever they would be advantageous.

5 LOWER BROACH REPLACEMENT COST—Through redesign of broach tools, forms can be broached progressively in one stroke by a number of inserts, each containing part of the form. This simplifies the form in each insert which decreases the original cost of the tools, cuts broach sharpening time. If any part of the form is damaged or worn, only that insert need be replaced.

The engineers and complete facilities of the Detroit Broach Company are at your disposal to help you get more production per hour and per dollar . . . on new as well as present broaching applications.

Detroit Broach Company specializes in the design and manufacture of broaches and broaching tools exclusively. Through this specialization their engineers are qualified experts on all types of broaching on all types of broaching machines. Some of the tooling principles that have emanated from this knowledge have been the great advancements in modern broaching. The consistent success of this tooling has made Detroit Broach the world's largest manufacturer of broach tooling exclusively.

Why not take advantage of the services shown at the left and have one of our application engineers make his recommendations in your shop. Many of the country's leading manufacturers have already found it a sure way to reduce production costs.

DETROIT *Broach* COMPANY
20201 SHERWOOD AVENUE
DETROIT 12, MICHIGAN

Famco 15-In. Drillpress Has 4½-in. Stroke

Spindle speeds for this drillpress range from 625 to 4800 rpm in standard models and from 490 to 3000 rpm on Slo-Speed Models. Speed reducing attachment facilitates spindle speeds as low as 185 rpm. Chuck capacity ranges from No. 70 to ½-in. Jacobs Chuck with No. 1 Morse Taper optional. Speed-reducing attachment together with belt guard and tapping attachment are optional equipment on all Famco models. Prices, less motorization, begin at $68.

Famco Machine Co., Racine, Wis.

Five-Chaser Rotary Diehead Threads Square Stock

The style KDS diehead with five chasers and intermittent cutting action, lessens the possibility of poor threads and distortion. This head can be applied to automatic machines, drill presses, and other machines where the diehead rotates.

In case of wear, removable segmental front plates may be restored to their original accuracy by truing on a surface grinder. A geometric four-chaser rotary taper diehead put out by the same company can be used for conventional-taper pipe thread, reverse-taper pipe threads or straight threads. Adaptation from one thread type to another can be made by changing one cam plate and one cam in the diehead.

The Geometric Tool Co., New Haven 15, Conn.

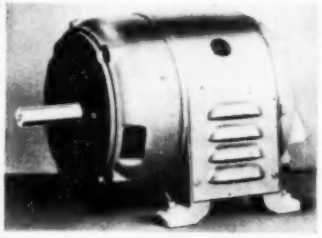
ROTO-WORKSAVER for dumping operations is a battery-powered hand truck. The non-tilting fork model is equipped with revolving fork carriage which rotates 360° to accomplish such tasks as emptying scrap bins, etc. Worksaver is available in 1000- and 1500-lb capacities and has a wheel base of 28⅜ in., an over-all width of 32 in., and over-all height of 83 in. Fork elevation is 60 in.—*Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia, Pa.*

Automatic Airline Drain Valve Has Only One Moving Part

The Wilkerson valve automatically drains off all water and oil that may collect in air lines together with dirt, rust flakes, dust particles, or other abrasive matter. Foreign matter is removed each time air is used. This valve is designed for application with impact wrenches, pneumatic drills, hammers, riveters, rotary grinders, spray guns, and other air tools.

The valve will handle from 0 to 28 cfm at 100 psi pressure. It is suited to a wide variety of line pressures.

Wilkerson Valve Inc., 260 South Dale St., Denver, Colo.



Direct-Mounted Motors Eliminate Cumbersome Transmission

A complete line of electric Unimount motors, especially designed for direct connection to driven machinery has recently been completed. Equipped with machined brackets, the motors are adaptable to pumps, compressors, mixers, machine tools, blowers, woodworking machines, and grinders. Installations may be made without changing existing machine designs or construction. Power ratings are from ½ to 100 hp.

U. S. Electrical Motors, Inc., Los Angeles 54, Calif. and Milford, Conn.

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THE
SPEEDI-MATIC
A 23 MINUTE
SOUND MOTION PICTURE
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"World's Fastest Hand Screw Machine"—that's what metal turning experts, everywhere, are calling the Monarch *Speedi-Matic*. It operates so fast, so accurately you have to see it to appreciate it.

Because you may not be able to spare the time for a trip to Sidney to see the *Speedi-Matic* demonstrated in our own showrooms, we've put its operation on film, ready to perform for you in your own office or assembly hall.

Into the brief space of twenty-three minutes we've packed eleven complete examples of its time-saving, money-saving performance on typical steel and bronze screw machine parts. And there's enough description of the *Speedi-Matic's* outstandingly unique design features to explain why it can make "peak production at a profit" a reality in your shop.

To secure the loan of a free print of this interesting and valuable new film, fill in the coupon below and mail to us, attached to your letterhead. Be sure to supply all requested information. That will help insure definite reservation for use at a time suitable to you.

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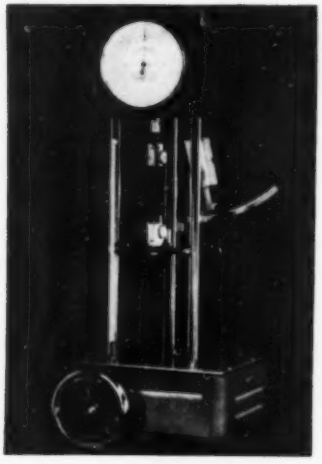
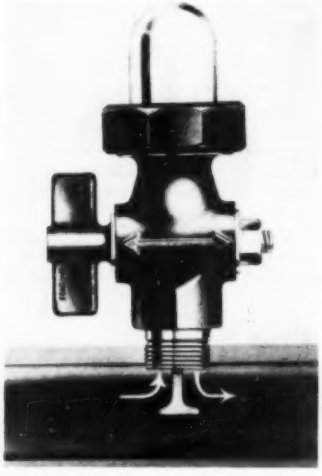


Dillon Low-Range Tester Is Entirely Hand Operated

Hand-operated multi-low-range universal testing machine handles specimens in tensile, compression, transverse and shear. Calibrations can be in tenths of a pound, ounces, or kilograms.

A number of easily interchangeable grips are available for specimens of various shapes and materials. The machine weighs 85 lb.

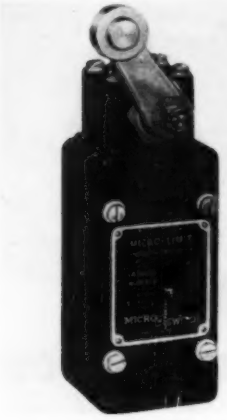
W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill.



Sight Glass Valve Gives Pressurized Liquid

Originally designed for observing the clarity of hot water passing through water-treating systems, the valve-type sight glass can be used in any system through which transparent liquids flow. Differential pressure is established across the deflector to allow some of the liquid to circulate continuously through a glass observation bowl. The valve permits easy removal of the observation bowl for cleaning.

Worthington Pump & Machinery Corp., Harrison, N. J.



Micro Precision Switch Adjustable by User

The Micro-Limit precision switch is encased in a die-cast metal housing which provides unusual protection for the inclosed unit. The synthetic rubber seal through which the actuating mechanism operates and the synthetic rubber seal ring under the cover plate prevent the entrance of dirt, dust, oil, water, or coolant.

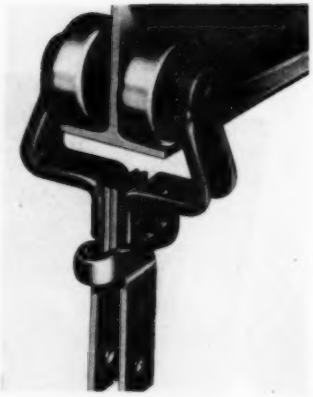
The switch is made such that the user may adjust the operating head at any of four horizontal positions. The roller-arm assembly may be reversed to position the actuator roller on either side of the actuator arm. The switch may be field adjusted to operate either clockwise, counterclockwise or in both directions. The Micro-Limit switch is designed for all types of machinery.

Micro Switch, Freeport, Ill.

Rule Gives Instant, Accurate Fraction, Decimal Calculations

Paper work is eliminated in the addition and subtraction of decimals and fractions by use of this Neighbors Rule. Fractions in question are matched and the correct answer is read in the proper window. Price is $1.

United Tool Service Corp., 3450 W. Harrison St., Chicago 24, Ill.



Small Overhead Conveyor Suspended from 3-in. I-beam

Light and easily installed, the Junior conveyor has a recommended capacity of 400 lb. It can be assembled and disassembled without tools.

The pulley rail can turn horizontal curves as sharp as 9-in. in radius. Trolley brackets are drop forged of high carbon steel. Load-carrying hooks and carriers are available in a wide variety of types.

Jervis B. Webb Co., 8951 Alpine Ave., Detroit 4, Mich.

Pin Riveter for Light Jobs Weighs 13 Ounces

Pin riveter drives both soft metal tubular and standard rivets. It is said to be well suited for setting small drive screws driving brads in the assembly of wood and metal toys, and light peening and scaling operations on thin sheet-metal sections and Bakelite.

The riveter is 6 in. in length, weighs 13 oz, its piston diameter is 19/32 in., stroke is ½ in., and the tool speed is 9,000 blows per min.

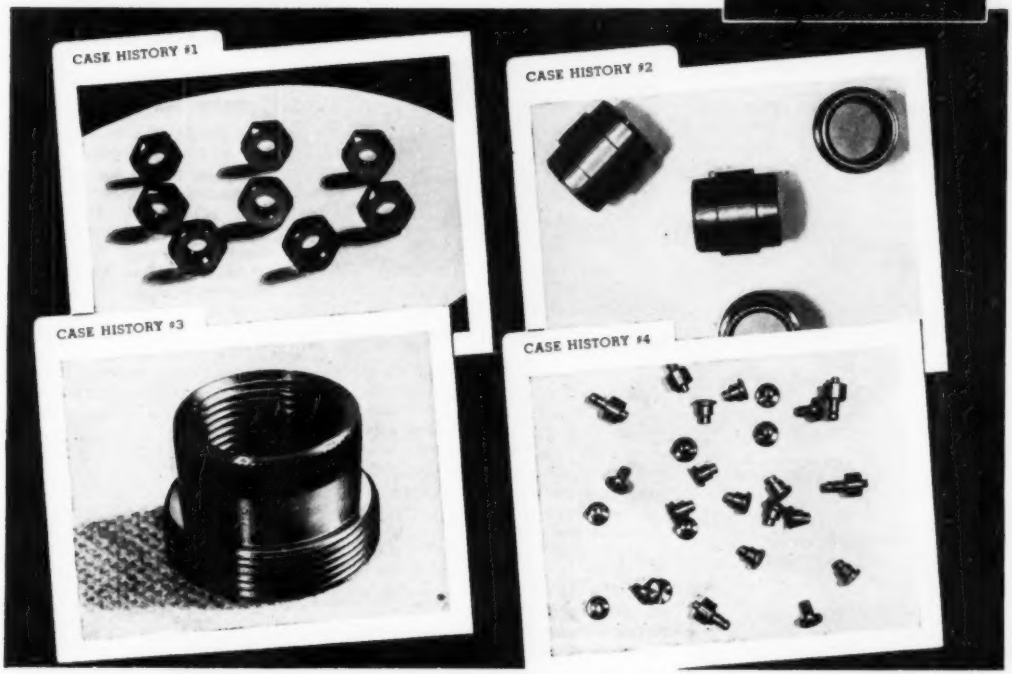
Keller Tool Co., Grand Haven, Mich.

Four typical machine shops report

"LONGER TOOL LIFE"
"BETTER FINISH"
"FASTER OPERATION"
} WITH NEW

J&L FREE-CUTTING "E"* STEEL

J&L STEEL



Four typical examples, taken from 100 case histories, show superior machinability of J&L "E" Steel.

For 4 years before "E" Steel was publicly announced, this new, free-cutting bessemer screw stock was tried by independent machine shops throughout the metal-working industry.

More than 6,100 tons were tested in over 100 applications!

Here are quotations from 4 typical case histories:

CASE HISTORY #1 ". . . tool life increased 100% at normal speeds . . . better finish . . . shop people liked it."

CASE HISTORY #2 ". . . tool life increased up to 200% . . . uniformity of finish remained constant . . . considerably increased speeds without sacrifice to finish."

CASE HISTORY #3 ". . . tool life increased two to four times . . . we were able to tap 1" full internal pipe thread, almost impossible on regular material."

CASE HISTORY #4 ". . . new steel machines very well . . . finish excellent . . . tool life increased . . . 5 to 10% better production."

You too can get greater economies in your machining operations with new J&L free-cutting "E" Steel. "E" Steel is available in three grades: E-15, E-23 and E-33, each within the composition limits of the standard bessemer screw steels and with similar tensile properties. All standard sizes and shapes are available. For further information write for your copy of our new booklet: "J&L 'E' Steel."

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Penna.

Please send me a copy of "J&L 'E' Steel."

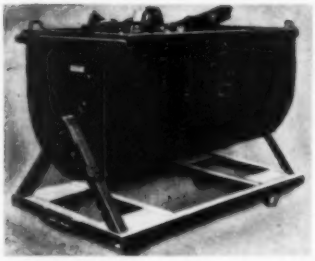
Name_____

Company_____

Address_____

JONES & LAUGHLIN STEEL CORPORATION

* "E" STEEL IS QUALITY-CONTROLLED FROM OUR OWN MINES THROUGH THE FINISHED PRODUCT



Mobile Dump Box Tilts 90° to Unload

Constructed of heavy reinforced steel this round bottom dump box tilts 90° and facilitates loading, unloading, and cleaning. Safety catches hold it securely at loaded or tilted positions.

The frame and truck are of square welded tube equipped with casters on bearings. Tow plates on the frame are optional.

Equipment Mfg. Co., 21550 Hoover Road, Detroit 5, Mich.

O'Neil-Irwin Power Shears Cuts 16-gage Sheet Steel

Precision power shears are for accurately and rapidly cutting square, rectangular and other straight-sided blanks, shearing narrow strips and trimming edges of sheets or parts. Cutting range of the Di-Acro power shear extends from the lightest in materials and plastics, fiber, mica, leather and rubber, to heavy gages of aluminum, cobalt steel, chrome molybdenum, leaded brass, stainless steel, and many spring-tempered materials. Top cutting capacity is 16-gage sheet steel. This precision machine is offered in 12- and 24-in. sizes.

A protracting gage for squaring and mitering, which can be quickly adjusted for any degree of angularity, is supplied with the Di-Acro power shear. This machine is operated by a non-repeating positive-action clutch, controlled by either a foot bar or a hand lever. The safety clutch can only be positively engaged by a deliberate intent of the operator insuring maximum safety and protection at all times.

O'Neil-Irwin Mfg. Company, Lake City, Minnesota.

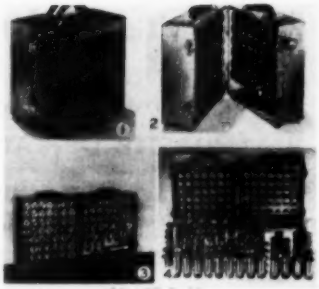
Electrically-Heated Dip Tanks For Plastic Coating of Tools

The Electrodip is a thermostatically-controlled dip tank made primarily for plastic coating of parts, tools, and dies. As an oil bath it is used to transfer heat at accurately controlled temperatures to irregular shapes, devices, and containers.

Closed-type 1000-watt heating elements and thermostat ranges 60 to 250 F, or 200 to 500 F are installed for either 115 or 230 volts as specified. The aluminum casting dip compartment tapers from 7 x 7 in. at top to 5 x 5 in. at the bottom and is 6 ft deep. Shipping weight is 47 lb.

H. McNaughton Co., 201 Parsons St., Kalamazoo, Mich.

SINGLE-POINT BORING TOOL designed for greater precision in deep hole boring is made of solid tungsten carbide. The tool is made in two sections; the head of a carbide having high wear-resistant quality, while the shank is made of a tough grade of carbide for maximum strength. Ten sizes comprise the line of these tools. Shank diameters running from 3/32 to ½ in. —*Bokum Tool Co., Detroit 21, Mich.*



Convenient Collet Case Carries Complete Set

Designed to cut down time loss due to misplacing of tools, this case contains a complete set of 5-C collets. The set includes 67 round collets ranging from 1/16 through 1-3/32 in. round in steps of 1/64 in., 9 square collets from ¼ through ¾ in. in steps of 1/16 in., and 11 hexagonal collets from ¼ through ⅞ in. in steps of 1/16 in.

Pegs on which the collets hang are marked to facilitate telling the size of the collets that are missing. Similar boxes for other sizes and styles of collets are made on special order.

Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland 23, Ohio.

Rimat Inside Micrometers Read From 0.490 to 12.020 in.

Rimat inside micrometer size range has been extended to cover all grooves for O-ring packing from dash No. 11 through dash No. 79. Semi-standard models now read continuously from 0.490 to 12.020 in. Standard tip sizes are 1/16- and ⅛-in. OD. Special tips as small as 0.015-in. OD are available.

Advantages of the Rimat inside micrometers include easy tool insertion and withdrawal, direct reading without transferring measurements, and long handle extensions for reaching deep recesses.

Rimat Machine Tool Co., 1117 Air Way, Glendale 1, Calif.

"One of the best money-making tools in our shop"

Forming cylindrical sections 8' 0" long, 5' 0" diameter from ⅜" steel plate.

With a Steelweld Press in your shop, you can handle almost any kind of a metal-forming job put up to you. Large heavy cylinders for buckets, drums, boilers, etc., are easily formed with standard bending dies.

You will find Steelweld Presses extremely versatile machines. With various jigs, dies and tools available, and others that can be developed for special purposes, a wide range of work can be performed on steel, aluminum, and the many alloy metals.

The opinions of many owners can be summed up in this statement of one: "A mistake that we didn't buy it years ago. One of the best money-making tools in our shop."

THE CLEVELAND CRANE & ENGINEERING CO.

1423 East 281st Street • Wickliffe, Ohio.

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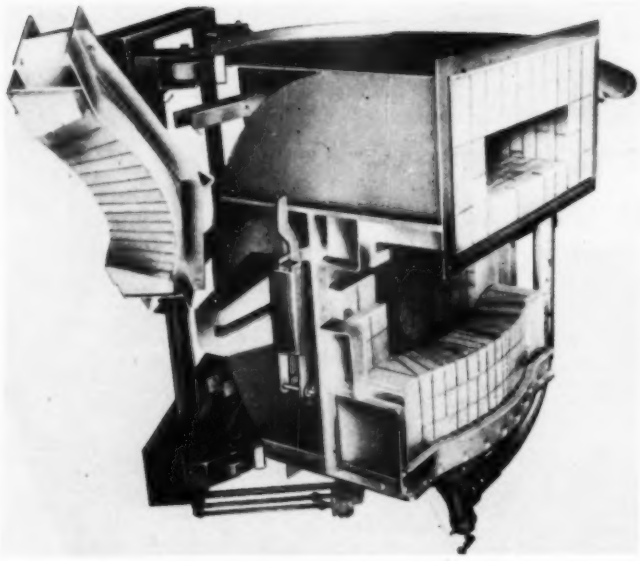
CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



Reverberatory Tilting Furnaces Produce 13 to 21 Melts Per Day

Self-contained units, fired with oil or gas, these Sklenar-type furnaces are for melting ferrous and non-ferrous metals and alloys. They range in capacity from 350 to 20,000 lb. Continuous charging is practical and can be used for melting metal in almost any form as well as ingots.

The metal is charged through a hopper which is also the exhaust from the combustion chamber. Here the metal is melted in suspension before it trickles down into the metal bed. No cold metal ever reaches the molten bath. This system results in fast melting and fuel economy.

Sklenar-type melting furnaces are readily accessible for skimming, refining, alloying, and inspection during the entire melt. Basic or acid refractories best suitable to the alloy to be melted can be used.

Hydraulic or compressed air automatic tilt is available for furnaces with capacities over 1000 lb of brass. The smaller furnaces are tilted by hand.

Each furnace is shipped as a self-contained unit, complete with burner, blower and motor, and air ram.

Bellevue Industrial Furnace Co., 2971 Bellevue Ave., Detroit, Mich.

Diametral-Pitch Gage Set Helps Predetermine Tooth Sizes

Consisting of 16 separate gages, this set covers 23 popular sizes from 4 DP through 64 DP. Each gage shows standard Brown & Sharpe tooth measurements.

Teeth in these gages are rack-type similar to those produced in hobs by cutter manufacturers. They are cut by the generating method. Checking gear teeth with rack-type gages approximates the method by which most gear teeth are generated, and is said to be most accurate.

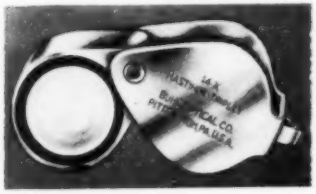
American Gear & Mfg. Co., 5900 Ogden Ave., Chicago 50, Ill.

Mechanically Held Tips Lengthen Life of Offset Tools

Shanks for styles FRH and FLH Kennametal offset tools serve as permanent toolholders. The cutting edge is a mechanically held Kennametal tip which can be advanced and reground as it becomes dull. Tips are held in position by a spring-steel clamp.

The tools are designed for both facing operations where the shank is perpendicular to the work and turning with the shank parallel to the work axis.

Kennametal Inc., Latrobe, Pa.



Pocket Size Inspection Loupe Has 14-Power Lens

Intended for critical inspections requiring an undistorted, color-corrected field the loupe has a 14-power cemented three-element lens system. Lens assembly is housed in a solid machined barrel which folds into a protective case. A spring in the hinge pin provides smooth folding action under constant tension. All metal parts, with the exception of the spring and two nickel-silver bushings are made of solid brass and chrome plated.

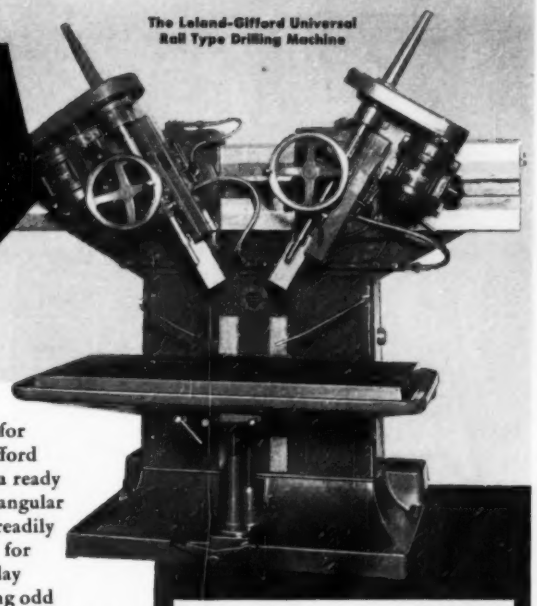
Bukl Optical Co., 1009 Beech Ave., Pittsburgh 12, Pa.

Mica Undercutter Designed For General-Purpose Lathes

The Trucut Mica Undercutter attachment is designed for use on general-purpose engine lathes. The unit is set up by merely replacing the lathe toolpost with the undercutter attachment. Commutators of any length and up to 6-in. diameter can be handled.

Frank N. Wood Co., 544 W. Main St., Waukesha, Wis.

FOR *DEEP ANGULAR* HOLES



The Leland-Gifford Universal Rail Type Drilling Machine

Widely used in the automotive industry for drilling crankshaft oil holes, the Leland-Gifford Universal Rail Type Drilling Machine offers a ready solution to many problems involving drilling angular or vertical deep holes. Universally adjustable, readily adaptable, highly efficient — it quickly pays for itself on production work . . . and saves the day time and again on small-lot production, drilling odd parts and producing experimental or special design work. Write for complete information.

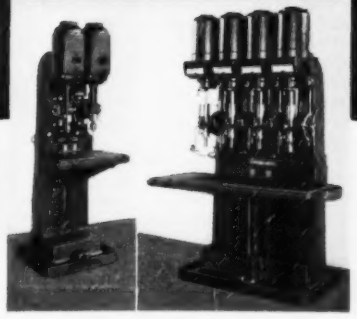
FOR ANY PRECISION DRILLING OPERATION . . .

Leland-Gifford offers a complete line of motor spindle drilling machines — plus unsurpassed engineering skill and facilities for designing special tooling and adapting standard machines to meet any production drilling need. A Leland-Gifford field engineer can show you how to improve production and lower drilling costs with Leland-Gifford methods. Call the office near you.

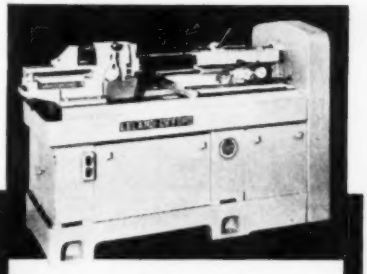
PRODUCTION MEN

Get This Handy Slide Rule

A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office or



Single or Multiple Spindle Drilling Machines; Light, Medium or Heavy Duty; Hand, Power or Hydraulic Feed; for Precision Drilling or Tapping.

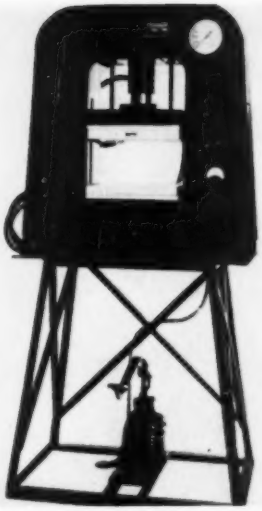


Step by Step Hydraulic Feed Drilling Machines; for horizontal, vertical or angular deep hole drilling; in Steps and Traverses to Meet All requirements.

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 6, 565 W. Washington Blvd.; DETROIT 26, 1533 Dime Bank Bldg.; CLEVELAND 1, P. O. Box 5547; NEWARK 2, Industrial Office Bldg.; ROCHESTER 1, Commerce Bldg.; LOS ANGELES 14, 724 So. Spring St.

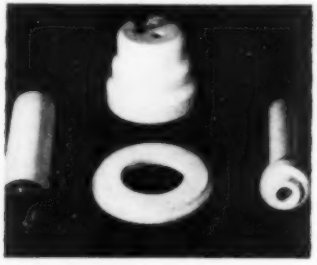


Hydraulic Laminating Press Puts Plastic Coating on Shop Papers

Electrically-heated platens and hydraulic pressure make this hydraulic laminated press especially adaptable for plastic laminations and other operations requiring controlled heat and pressure. The press will laminate six 8½- x 11-in. sheets in one operation in ten minutes.

Platens are electrically heated on 220 v 22 amp and are thermostatically controlled with pyrometer temperature gage. Pressure is obtained by a foot-operated hydraulic pump unit.

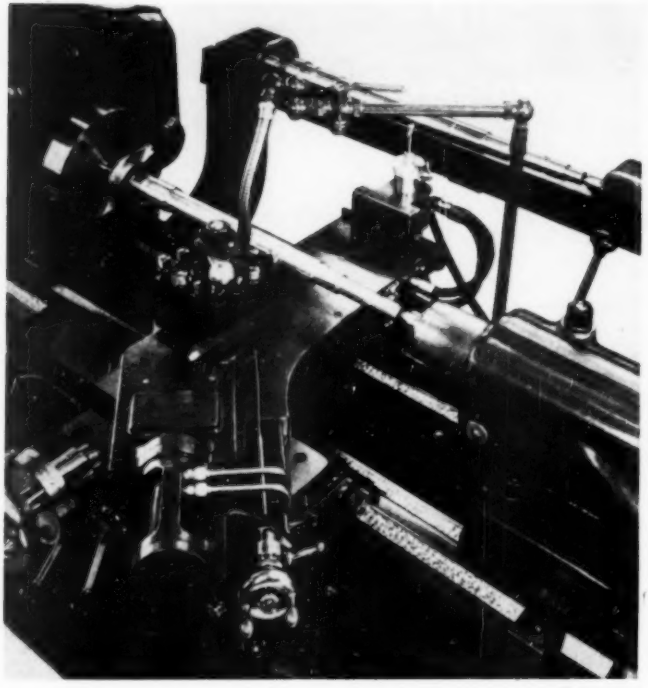
Studebaker Mfg. Co., 1221 South 9th Ave., Maywood, Ill.



High-Strength Ceramics Used for Mechanical Parts

Properties of these high-strength industrial ceramics make them naturals for mechanical parts where corrosion, wear, friction, or high temperature affect the durability of metals or other materials, or for electrical application where superior dielectric properties are required. Resistance to corrosion and friction make them practical for such items as high-pressure valve parts and bearings. The ceramic parts can be made with extremely close tolerances and fine finishes in various types for specific services, depending upon the operation requirements. Physical properties vary according to the type. AI-200 Alumina, for example, has a tensile strength of 25,000 psi, compressive strength of 290,000 psi, coefficient of expansion about 50% that of steel, specific gravity of 3.63, and hardness comparable to natural sapphire. The coefficient of friction for all types of ceramic parts is very low.

Coors Div., of Landes, Zachery and Peterson, 272 S. Santa Fe Drive, Denver 9, Colo.



Turchan Automatic Follower for Precision Machining of Odd Shapes

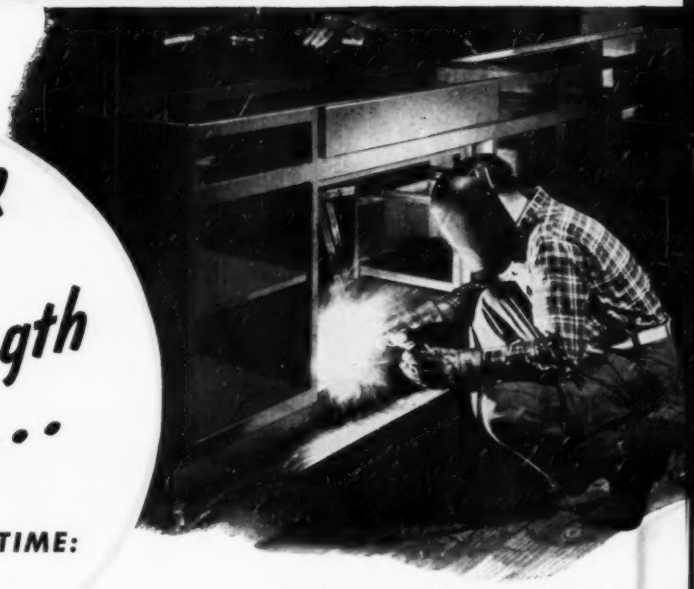
The Turchan basic principle for this automatic follower consists of the following basic parts: power unit which is heart of the unit supplying fluid under pressure; tracer that controls the flow of oils supplied by the power unit; and cylinders or fluid motor, the means of transmitting the controlled fluid flow under pressure to the movement desired. Milling machines can be converted into a die-duplicating unit by controlling either the movement of head or knee with the Turchan combination. In some cases it is needed to control the cross and longitudinal movement of the table and others to control all three movements at one time. By using tracer control along with automatic cycles, it is possible to produce the odd-shaped forms on a high production basis, using the standard machine tool.

Illustrated is a compound slide, rigidly built, mounted at 45° to center line of lathe and controlled by a Turchan follower. To produce the shaft at a rapid pace, it is only a matter, after first part is produced, to turn down the first diameter to size, turn on the longitudinal feed and all other shoulders are produced automatically. Going further many other shapes could be turned.

Turchan Follower Machine Co., Detroit 4, Mich.

54 EVERDUR WELDS for extra strength and rigidity . . .

TOTAL WELDING TIME: FIVE MINUTES



Electrically spot-welded Harrison Steel Kitchen Cabinets being carbon arc welded with Everdur rod. Circles on finished cabinets, below, indicate 54 points where members are reinforced.

THIS is the way Vincent Russo, Superintendent of the Harrison Steel Cabinet Company of Chicago, tells the story:

"Although our steel cabinets are electrically spot-welded throughout, we have found that carbon arc welding the corners and joints with Everdur* rods assures the additional strength and rigidity a quality item deserves.

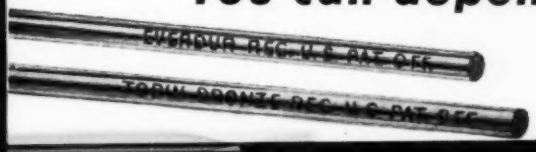
"Years ago we found that by bronze-welding our drawer guides in the cabinets, rather than screwing them in place, not only was added rigidity obtained, but we eliminated the possibility of drawers getting out of line because of loosened screws.

"In our average-size sink and wall cabinets there are a total of 54 carbon arc welds made with Everdur rod. While this seems excessive, our actual welding time is less than five minutes, due principally to the low melting point of this copper-silicon alloy rod. The additional cost of this welding is far overshadowed by the extra strength and added quality."

Anaconda Welding Rods are available in a wide range of alloys suitable for many oxyacetylene or arc welding purposes. They are fully described in Anaconda Publication B-13. For your copy write to The American Brass Company, Waterbury 88, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 49155

*REG. U. S. PAT. OFF.

You can depend on



ANACONDA

BRONZE WELDING RODS

NOW—Quick Changes of Cartridges

with this Cover-Lifting Device . . . .

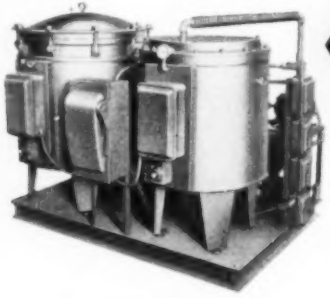
Standard equipment on all but smallest sizes

THE HOFFMAN CARTRIDGE FILTER

A new high in modern efficient design has been achieved in the Hoffman Cartridge Filter line. Swing bolts simplify and speed up head removal. Exclusive head-lifting device assures quick, easy access for cartridge replacements. Domed head construction and thick insulation reduce heat loss — save fuel. Today's need for more dependable, effective filtering of fuel and lubricating oils is strong reason for further investigation of the full details on Hoffman Cartridge Filters. Write today for complete information.

Navy-size (7 x 18) throw-away cartridges are used in one series of Hoffman cartridge filters. Multiples of 1, 2, 4, 7, 9 and 18 cartridges. Another series uses 11 x 18 cartridges, either repackable or throw-away type, in multiples of 1, 2, 3, 4, 6 and 8.

THE HOFFMAN OIL CONDITIONER



Capacities of 50 to 600 g.p.h.

Restores used oil to like-new condition. For hydraulic, lubricating and run-in oil. Combination cartridge filter and vaporizer removes both insolubles and solubles (air, gas, moisture and fuel dilution). May be operated separately or together. No steam or water connections.

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CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO., LTD., NEWMARKET, ONT.

ROUND TABLE Discussion

MEN ONLY

This seems like a voice from the void when men were held to be gods and women their slaves. But we have moved far since then; the gods were found to have feet of clay and the slaves were more godlike than was then thought. Women are always with us from the cradle to the grave, without whom the one-time gods would be in a sorry plight.

Do women really create disturbances in the workshop? Need they? We see them everywhere; they drive cars and fly aeroplanes, write books, paint pictures, qualify and practice as doctors and lawyers, sing, speak, preach, lecture, design—and do most of the things men do, and as well. Can it be that Ed fears that the last stronghold of the engineer is in danger of being attacked, and may fall, his sanctum sanctorum—the toolroom?

And yet nothing can stay the march of progress. Shocked was the world when the divided skirt was introduced and yet today girls wear uncovered "breeks" in the workshop. It would seem almost that the feet of those old gods must have been made of sand rather than clay. In this country, before, during and since the two world wars, women have worked many types of machines and performed numerous operations, thereby doing an excellent job; helping undoubtedly to win both wars, an achievement for which, whether there is a shortage of labor or not, the means should be retained. In their retention, men would soon take no more interest in the skirt and its wearer in the workshop than in the street. This may create more anxiety in the feminine mind and less disturbance to that of the male, or to production. It may be that the old boast "The ladies, God bless 'em" will yet be heard at engineering functions.

P. E. James

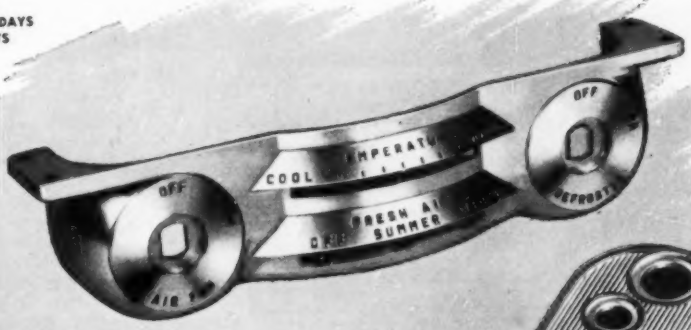
Lincoln, England

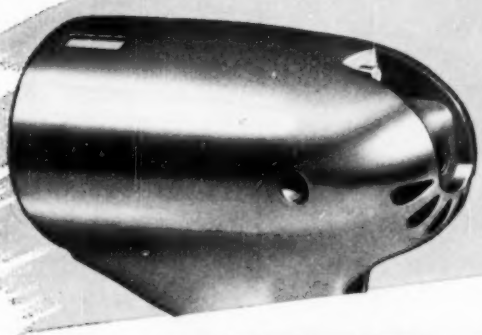
•

HARD SENSE OR HARD HEAD?

Whenever shop conditions are such that men feel that they are a part of the firm, and not merely working for wages, there is no reason why they would hesitate to do all in their power to promote the cause of progress. Al's idea to call upon

TUNE IN "SUSPENSE!"
CBS RADIO NETWORK THURSDAYS
CBS TELEVISION TUESDAYS





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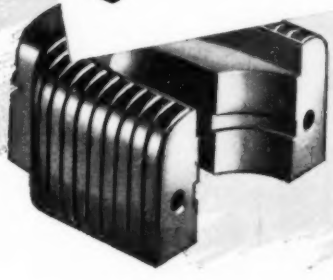
DIE CASTINGS

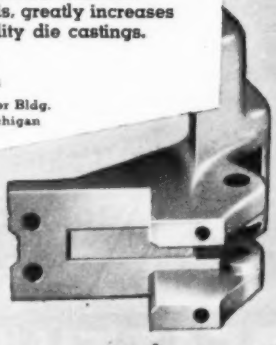
● Increased production facilities for die castings made possible through the famous Auto-Lite "controlled metals" processes are now available. The opening of the great new Lockland plant of Auto-Lite, combined with the enlarged facilities at Woodstock, Illinois, greatly increases Auto-Lite's ability to furnish high quality die castings.

THE ELECTRIC AUTO-LITE COMPANY
Die Casting Division, Woodstock, Illinois

600 S. Michigan Ave.
Chicago 5, Illinois

723 New Center Bldg.
Detroit 2, Michigan

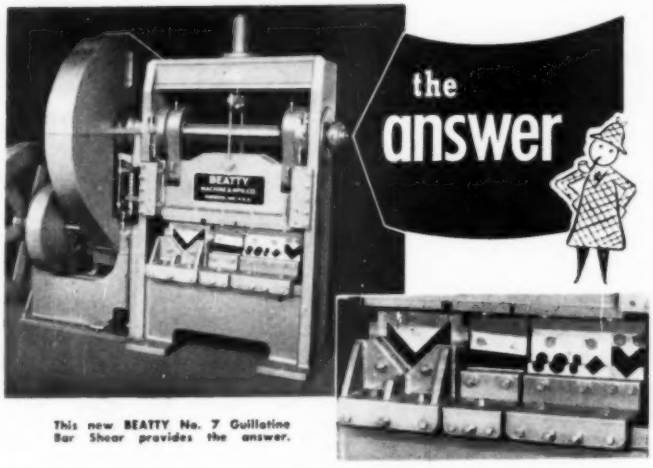




Inquiries invited

Catalog will be sent on request.
Write on your company letterhead.

The problem was "short order" warehouse shearing — one of this, one of that, one of the other thing.



This new BEATTY No. 7 Guillotine Bar Shear provides the answer.

New Beatty Guillotine Shear Solves *"Short Order"* Shearing

Typical of Beatty problem-solving is this new bar shear which allows for "short order" shearing of rounds, squares and bars *without* changing tools. The new machine offers a 48" base on which are mounted 2 sets of angle shear blades, 1 set for shearing flats, and blades to shear squares and 3 sizes of round bars. Other tools for shearing other shapes are available. Let Beatty engineers help solve your problems. These machines are built in capacities from 50 to 450-tons.

Write for data on this new Bar Shear

HYDRAULIC PLANT MINE WORLD EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

the men to assist in solving a difficult problem has its merits. Ed seems to feel that to make known his inability to overcome a tough assignment would cause him to lose face.

Why, Eddie! Shame on you. Don't you know that an acknowledgment of defeat is no disgrace? To admit being stumped is a mark of good sportsmanship as well as personal progress. Let it be known that you're losing hair over some difficult problem and you'll be surprised how the manna will fall—even Evelyne might loosen up her girdle and come forth with the simplest idea which may be just the spark you want to get your gray matter functioning to a glorious end.

Eddie, my boy, it is the fellow who is a know-it-all whom we have to keep our eyes open for. When an executive gets to be one of that kind he is through. He loses influence; his men hold back—they don't open up as they should with information which they feel in their hearts will result in saving of costs. The foreman who makes his men feel that their ideas are of no consequence is just the fellow who kindles the fire of mental sabotage—the deliberate withholding of valuable information.

I would like to call attention to two individuals of my acquaintance —one a foreman who considered himself an industrial "God Almighty" and another at the shop helm who was losing weight over a tantalizing problem in production. The one with the oversized hat was an expert in his line, but unfortunately he had one great fault—he couldn't be told. One day one of his men, taking note of the fact that he was experiencing difficulty with a certain job, volunteered a few words. When the foreman got through telling him off the poor chap curled his tail between his legs, as it were, and sought the comforting seclusion of his own bench. He said something about Hell freezing over and from then on minded his own business.

The second executive, another enigma, came out point blank and asked for ideas. His trouble was in tapping out a small diameter, coarse-pitch, square thread. Being young, and thinking that I had an idea worthy of consideration, I went to the rescue. Bill sort of sneered at my idea but agreed to the decision of the tapmaker. I tossed around on my pillow at night anticipating the firm's reply to my letter and sketch. When it did arrive I willingly submitted to their recommendation but nothing but plastic surgery would remove that annoying smile from Bill's face. "Well, Jack," he finally said, "if they say that

Faster Feed... Lower Costs!

MORE WORK BETWEEN GRINDS

BOSS CUTTERS

with T-J CUTTERS

CHERRYING CUTTERS

ROUGHING CUTTERS

ANGLE CUTTERS

END MILLS

This T-J Cutter at work on a connecting-rod die block for a board drop hammer. Material being milled is "Hardtem" die steel. A cutter of right design and heat treatment for this high speed work in tough die steels, making possible maximum efficiency of these machines.

T-J Die Sinking Milling Cutters "have what it takes" for cutting tough die steels with *speed* and *accuracy!* They're *extra sturdy*... hold a sharp edge longer... less breakage! Made from a standard, extremely high grade steel... properly machined... scientifically heat-treated and accurately ground. Wide range of styles and sizes ... ready for your tough jobs! Send for new catalog. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

DIE SINKING MILLING CUTTERS

*CONQUER those Handling Costs!... as the quickest, surest way to bring down unreasonably high production COSTS!

To find and realize *your* opportunities for *big* savings in this incomparably rich field,

*CONSULT the leading producer of modern handling methods and machines... CLARK

How a great many leading businesses are conquering costs—with quick and substantial profit to themselves—is described and illustrated in Material Handling News and in Clark's invaluable motion pictures. You can enjoy the benefits of both by requesting them on your business letterhead.

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three taps will do what twenty have been doing, I'm willing to be shown —but I think you're all wet and them too."

The taps arrived in time and the test run was put in operation. The three taps ground their way through the first long nut and produced a beautiful thread. I, theoretical me, stood to one side with folded arms, smirking at the ease with which the difficulty was overcome. Bill, the representative of practicality, leaned comfortably against a column nearby, his face warped with that ominous smirk. The first and second tap dropped through the second nut but the third had a severe case of labor pains shortly after it entered and what happened to that tap will have to be surmised. Bill let out with a loud guffaw and wandered slowly away while I—well I just can't remember what happened to me. What classification can we put such a man as that? He admits he's stuck and is willing to give your idea a trial, then turns your warm blood to tingling ice with his fiendish laughter while you sink for the third time in the sea of dismal failure.

J. Homewood
Ontario, Calif.

•

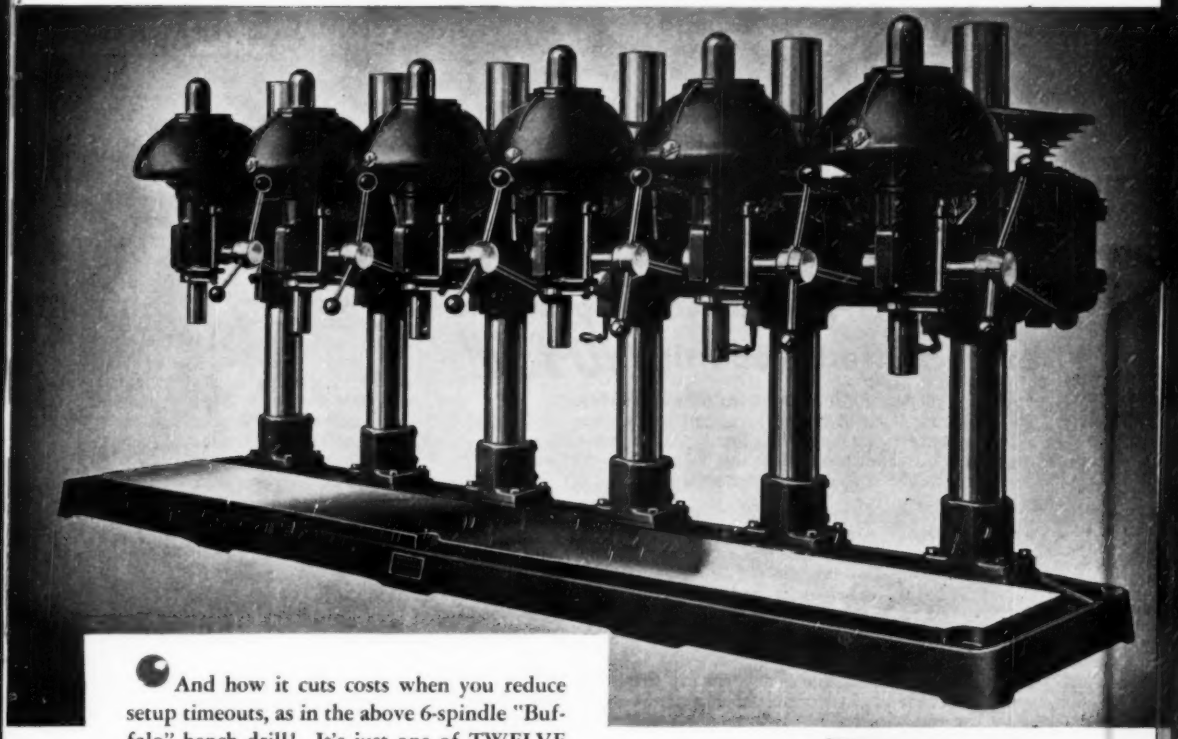
IS IGNORANCE BLISS?

In the sense of your Round Table topic, ignorance of function is probably neither a blessing nor a curse. The ideas of the designer are fixed by drawing and tolerances and, by means of inspection and test, only those pieces which conform to these are passed for use. The idea that more knowledge of the product's function would enable men to see where "a little leeway" could be allowed would be more likely to cause "confusion worse confounded" than to be of use.

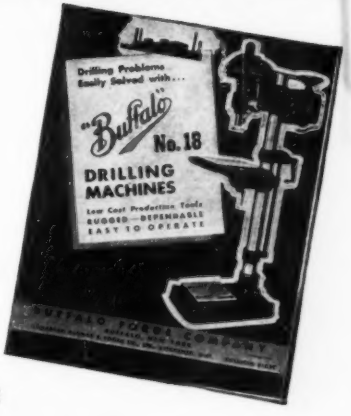
At the same time, to provide facilities for men to become acquainted with the firm's completed products is good. They will be able to appreciate how much better the whole looks than the insignificant part on which they may have worked and, it may be, the importance in function of that same insignificance. Men are naturally interested in their own firm's products and to see, and to know, the finished article is likely to engender a feeling of pride which will become embodied in their work.

It is reported that an admirer of Cologne Cathedral in its completed condition expressed his admiration to a stander-by, and was surprised at the response. "Yes: it took us a long time to build it." "What was your

YES, UP TO 6 OPERATIONS AT ONCE
with these rugged, easy handling
"Buffalo" No. 18 DRILLS!



And how it cuts costs when you reduce setup timeouts, as in the above 6-spindle "Buffalo" bench drill! It's just one of TWELVE models to choose from, in "Buffalo" No. 18 Drills—all engineered to fit specific preferences—one to six spindles, floor or bench models. And note these features: crank adjustments (no loose wrenches about); smooth ball bearing spindle assembly with no end play; 3-prong hand feed for easy, quick operation; rugged 4" steel column; capacity, 1" in cast iron. WRITE FOR BULLETIN 3123-C—pick the model YOU need—work it as hard as you want—and watch costs come down!



"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

509 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

HY-PRO licked the problem and increased production *10-fold!*

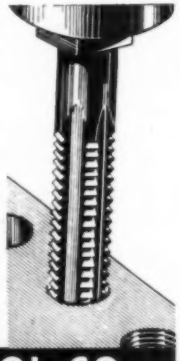
PARTS: Anchor pieces of 1020 steel with *punched holes.*
PROBLEM: Tapping with ordinary taps had to be done at very low speeds to prevent welding tap to piece. Changing cutting oil made no difference. Taps were continually galling in the soft, stringy material.

Then they called the HY-PRO Sales Engineer.

HY-PRO SOLUTION: He recommended a Hy-Pro ¾-24 3 Flute Spiral Point Tap with the exclusive Hy-Pro Ferrox Surface Finish. Running at a speed of 50′/min. with a water-soluble lubricant, production increased tenfold. The Hy-Pro Taps never galled in the soft, stringy steel and stayed sharp longer in spite of the work-hardened, punched holes.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.



Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

part in it?" came the question. "I helped to mix the mortar." Sounds silly, but was it, is it? Did not a Jewish slave girl tell her Syrian mistress that if her master would consult the prophet of her country, he would cure her master of his leprosy? The advice first spurned was later taken. Often there is much in the apparently little.

J. E. Powell
Lindum, England

•

Al's suggestion that the completed machine should be in view where all employees can see it running is a common-sense suggestion. It would certainly stimulate interest. Not only that, but it would be of real value to both employee and employer. It would enlighten the men tremendously and certainly help speed up production.

Few machinists have not made parts that aroused their curiosity. They would have loved to see such pieces functioning as a part of the machine or finished product, knowing just how it functions, what it does and how important it is to the machine.

If, as Al suggests, his idea is carried out, it would be a better education to the machinists than all verbal instruction and blueprints in the world. They will at first glance be enlightened just as to why this dimension might be plus or minus a few thousandths of an inch; why this part is ground and another just turned.

Also it will cause discussion among the machinists and you can be sure that questions will be asked. And who knows—some good suggestions for speeding up methods of machining, a change in operation, may turn up to save time and money.

You know the youngsters are taught to think today, and they are better equipped to do so than we were in the old days. Ed should have been a boss 50 years ago when the policy of "You are not paid to think—I'll do the thinking around here" was generally speaking the attitude of a superintendent when some bright youngster thought he had a bright idea that would help production.

In conclusion, as Ed believes that only the sales engineer's job makes it necessary for that person to be thoroughly trained to completely dismantle or assemble and also to be able to discuss its construction with customers, it is very obvious that no employee under Ed's supervision could even begin to qualify

HARPER

NON-FERROUS AND STAINLESS STEEL
EVERLASTING FASTENINGS

have 13 advantages to 1 over common steel

1—Resistance to Rust and Corrosion
2—Resistance to High Temperatures
3—Non-Magnetic
4—Non-Sparking
5—Re-Usable
6—Attractive Appearance
7—Easy to Clean
8—High Strength
9—Long Life
10—Lower Ultimate Cost
11—Resistance to Fatigue
12—Easy to Plate or Finish
13—Resistance to Abrasion and Wear

COMMON STEEL—*lower first cost ONLY*

An amazing combination of advantages in favor of non-ferrous and stainless steel bolt and nut products over common steel at only a slight additional cost . . . in many cases only a fraction of a cent per piece.

OVER 6,000 ITEMS IN STOCK

The widest assortment of bolts, nuts, screws, washers, rivets and accessories from a single source in from three to ten different metals, including

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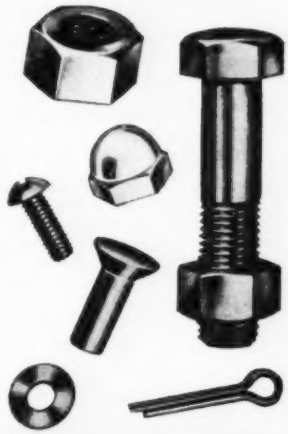

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CYLINDRICAL DIE THREAD ROLLERS

Thread rolling is a cold forging process that forms the thread by displacement of metal. It produces a uniform, smooth, precision thread at high rates of production.

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Devoted exclusively to the design and manufacture of Thread and Form Rolling machinery and tools, Reed pioneering experience and skill is available to help do the complete job, from engineering application to final production. Technical data on bolt and screw thread standards and thread rolling practice, as compiled by our engineers, is available to interested customers.

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REED ROLLED THREAD DIE CO.

Manufacturers of

THREAD ROLLING MACHINES AND DIES • KNURLS • THREAD ROLLS

Worcester 2, Massachusetts, U.S.A.

AM-912

for a position on the sales force, due to the fact that Ed's policy of not making it possible for them to get a thorough knowledge of the equipment by not adopting Al's suggestion of having a completed machine running to be observed and studied and demonstrated for the enlightenment of all.

Arthur Silvester
Niantic, Conn.

•

In the cases of steel or lumber, there is no advantage in having the workman know what is the final use of the material he may produce. Both are raw materials and are primarily made to become parts of final assemblies. A complete machine, or a certain mechanism which may become a part of it, is an entirely different proposition and hinges upon other ideas.

Many seasoned mechanics, as well as progressive apprentices, have become familiar with the entire and complete mechanism upon which they have worked and their interest hasn't hurt them a bit. If they are given at all to egotism, they will, when arriving home at night, boast about the high class of work they are doing.

A few years ago a small device of a mechanical nature was turned out by the thousands and, as they were made to a high degree of accuracy, every man who did any mechanical work upon them or who was upon the assembly bench, could and would tell of his work because of the close tolerances and fine limits.

During the last war, a plant where shells were made kept falling behind in its production schedules and didn't appear to be able to pull out of this spell.

No workman seemed to be sufficiently interested to put forth the additional effort to help matters in any way.

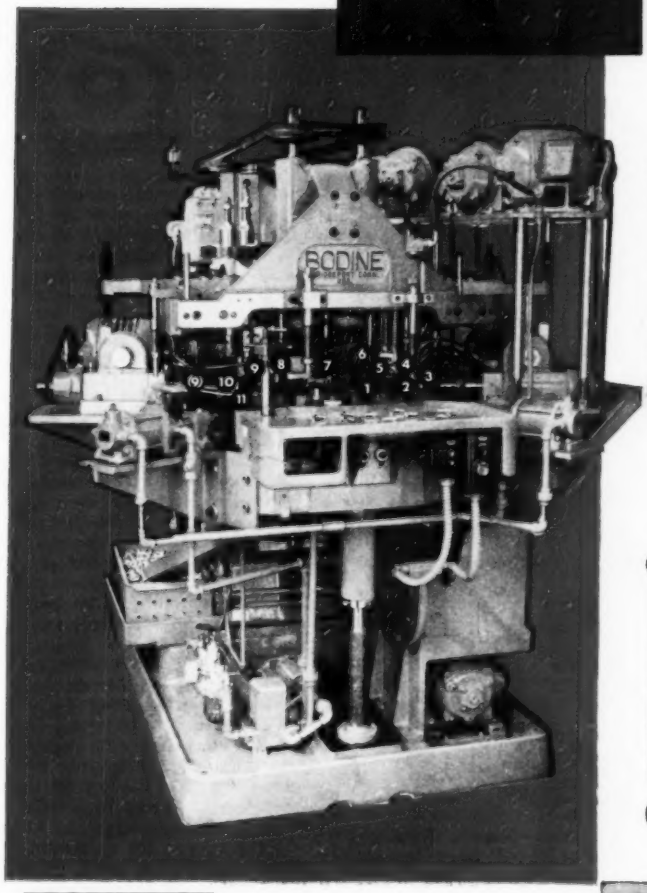
This firm believed in acting upon suggestions made by the employees, so they had a suggestion box. One day, a suggestion was placed in the box, and it said that many men would be interested, and possibly might be awakened, if they could witness a firing test of the shells then being made.

The government requirement was that two shells out of each certain number should be fired, and they must meet the army regulations in order to be accepted.

Two shop men were selected, by lot, and were taken to the test field. They saw several shells fired, including those from the shop where they worked. They returned, filled

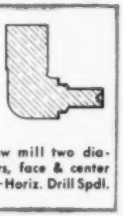
Bodine CASE HISTORY NO. 25

Processing a Forged Brass Tube Connector



1. Hand load forging to clamping fixture dial.
2. Center forging in fixture, automatically clamp (air cyl.).

3. Hollow mill two diameters, face & center end — Horiz. Drill Spdl.

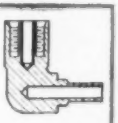


4. Face large end, chamfer & spot drill — Vert. Drill Spdl. Drill .176 dia. hole to half depth — Horiz. Drill Spdl.

5. Trepan to 1/2" depth — Vert. Drill Spdl. Drill .176 dia. hole to 1-3/16" depth — Horiz. Drill Spdl.

6. Tap trepanned recess 1/2 x 12 — Vert. Spdl.

7. Drill 13/64 hole to half depth — Vert. Drill Spdl.



8. Hollow mill large O.D. and finish drill 13/64 hole (combn. tool) — Vert. Drill Spdl.

9. Ream .176 dia. hole 1-3/16 deep — Horiz. Drill Spdl. Remove chips from trepanned cavity — Vert. Drill Spdl.

10. Automatically unclamp (air cyl.).
11. Automatically Ejects.

PRODUCTION

Machine equipped with . . .

4 Horiz. Drill Spindles
5 Vertical Drill Spindles
1 Vertical Tap Spindle

One operator produces a completed part every 3 seconds — 20 pieces per minute — 200 operations per minute.

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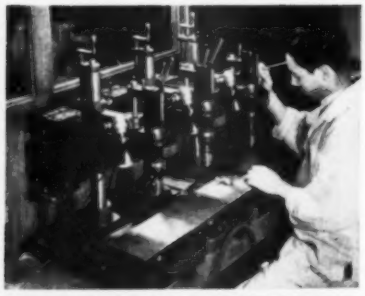
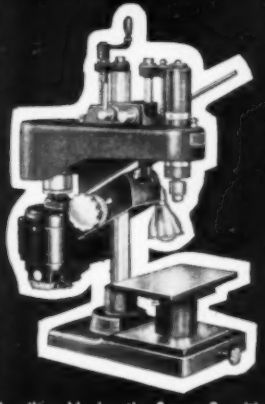
CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



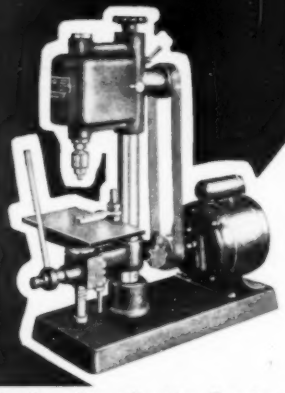
Note in the photo above how the tables butt to form a continuous work surface when machines are installed in batteries.

AT THIS POINT
YOU CAN SOLVE YOUR SMALL HOLE PROBLEM

If your job includes the drilling and tapping of small holes, with surgical precision and on tight production schedules, the two Hamilton precision tools shown here were built to meet your special need. They excel in fast, precision drilling and tapping of small holes in materials as diverse as paper and monel or ceramic and bronze. *And more* their flexibility, sensitivity, and stamina far exceeds the requirements of the average user.



Hamilton Varimatic, Super-Sensitive Drilling Machine. Infinitely variable speeds from 840 to 9300 R. P. M. Drills holes from .004" to 5/16".



Hamilton Super-Sensitive Tapping Machine. Patented power transmission. Tap idles in reverse and automatically changes direction of rotation when pressure is applied to feed lever. Released pressure again reverses spindle, reduces speed to "idle" and withdraws tap. Capacity from the smallest and finest tap to 10–32 inclusive.

For complete specifications and prices write today for our Varimatic Bulletin V-47 and our Tapper Bulletin T-47.

THE Hamilton TOOL COMPANY

SUPER SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELVATORS

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with enthusiasm for their daily work.

By the time the next test was held, six men witnessed the performance and so the privilege was passed around.

Then the army regulations were tightened up and no more witnesses were allowed.

Now, none of these men had ever contemplated the power which is in a shell, but the men began to rally while interest went up and so did production. Men in this plant really became old boys and swelled with pride as they actually realized that they were actually helping to win the war.

At the end of the second month, production was about 4% above normal, so another blister in a line of manufacture had been overcome, all due to a suggestion made by a workman.

This shows much and proves that a small beginning can, in the way of a suggestion, turn out to be great and it probably saved the firm from possible financial embarrassment.

F. H. Stebbins
Worcester, N. Y.

•

CAN ENGINEERS COME INTO THE SHOP?

What is our world of today coming to? Are we to put up barriers between the office staff and the workers in the shop? It's true that the engineering boys and the "brass hats" usually don their bib and tucker in some cafe to partake of noon lunches while the majority of the working men in the shop eat theirs out of the conventional tin bucket, accompanied by a jug of java, but this is not exclusion.

Where would the shop be today that left out the intimate contact between the men designing the work and those completing the work? Most of our enterprising engineers have gotten their start with only a college sheepskin to represent their interest in the trade. The best spot for this eager youngster to learn why the man in the shop must be considered and that some jobs are theoretically possible—but impossible to do—is in the proving grounds of the organization, the working machine shop.

Also gained by these journeys into the land of realistic achievements is the opportunity to see the planned drawing take form as it travels through the various operations. If the job can be improved along the line, that is the time to make the change, not after more valuable man hours have been expended. It is a

MORE EXTRA FEATURES OF OILGEAR BROACHING MACHINES

Built as YOU would build them

HERE BROACHING IS *ACCURATE* AND ACCURACY IS PERMANENT

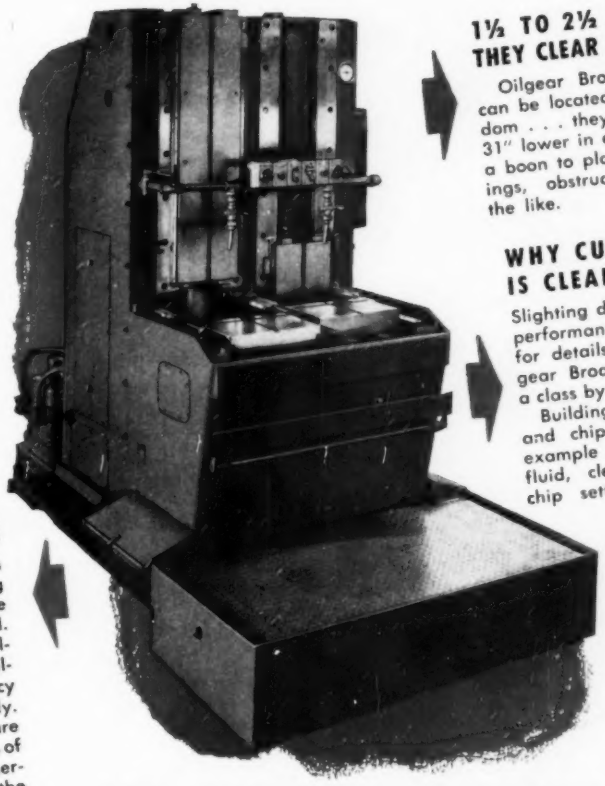
Welded machine frames are tough, sturdy, **homogeneous** structures. Especially, when the designing, welding and annealing are supervised and performed by Oilgear personnel having twenty years' experience in the manufacture of broaching machine weldments.

The permanent rigidity of Oilgear Broaching Machines in the field testifies to the care the men who build these machines exercise in welding and annealing . . . one more reason why Oilgear Broaching Machines produce so much work at such close tolerances.

HERE YOU SAVE ON OIL COSTS, POWER AND SPACE

For those who can read between the lines . . . Oilgear Broaching Machines use only **ONE FIFTH** the usual amount of fluid power oil. This is possible only because Oilgear Machines have been developed to a high peak of efficiency . . . structurally and operationally.

Heat and power losses are fractional. **You** save up to 80% of oil cost. The very small oil reservoirs save space, help make the whole machine more compact.



1½ TO 2½ FEET LOWER THEY CLEAR LOW CEILINGS

Oilgear Broaching Machines can be located with more freedom . . . they are from 18" to 31" lower in overall height . . . a boon to plants with low ceilings, obstructing cranes and the like.

WHY CUTTING FLUID IS CLEANER—ALWAYS

Slighting details mars perfect performance every time. **Care** for details helps to put Oilgear Broaching Machines in a class by themselves.

Building bigger cutting fluid and chip compartments for example results in cleaner fluid, cleaner work, better chip settling, less frequent chip removal, improved housekeeping. Another detail—you don't have to drain the compartments when inspecting cutting fluid pumps.

NO EXTRA CHARGES—

YOU GET A COMPLETE MACHINE

When you buy an **Oilgear** Machine, you get a **complete** machine. This is what you get in an Oilgear Broaching Machine, **always**, and at no extra charges:

A fluid power system that gives you, within the specifications of the machine, an **unlimited** range of infinitely, independently variable broaching and return speeds. **NOT** a **fixed** range, **NOT** a **low** range.

Complete manual, semi-automatic and full automatic cycle control. You **don't** pay extra for this.

Dual safety-pushbutton control—at no extra charge.

Shuttle tables—at no extra charge.

Cutting fluid pump, control, wiring, piping, nozzles, splash guard—at no extra charge.

Up to 130% wider tool slides and work tables—at no extra charge.

These are just a few of Oilgear Broaching Machine features. Compare what you get in Oilgear—don't be fooled.

Descriptive bulletins are available on all Oilgear Broaching Machines; write THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wis.

Oilgear Fluid Power

BROACHING MACHINES AND BROACHING PRESSES

ECONOMY IN PRODUCTION

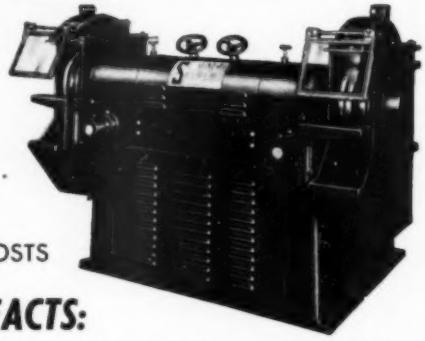
WHY NOT A MODERN GRINDING ROOM?

STANDARD'S NO. 35

GIVES YOU PEAK EFFICIENCY...

SAVES TIME

SAVES WHEEL COSTS



CHECK THESE FACTS:

1. Each operator is entirely independent of the other, giving you a 2 in 1 machine!
2. 9500 S.F.P.M. can be maintained on resinoid bond wheels down to wheel flanges by adjusting wheel guards through "Hand Wheel"!
3. No gears or belts to change.
4. Positive interlocking control—wheels cannot be over-speeded.

PROMPT DELIVERY! See this machine in operation at our Booth 1628 at the National Metal Exposition, Cleveland, O., Oct. 17-21.

No. 35 is available with two five, seven and one-half, or ten H.P. Motors for wheels from 20" to 30" in diameter.

Write for catalog 44 today!

THE STANDARD ELECTRICAL TOOL COMPANY

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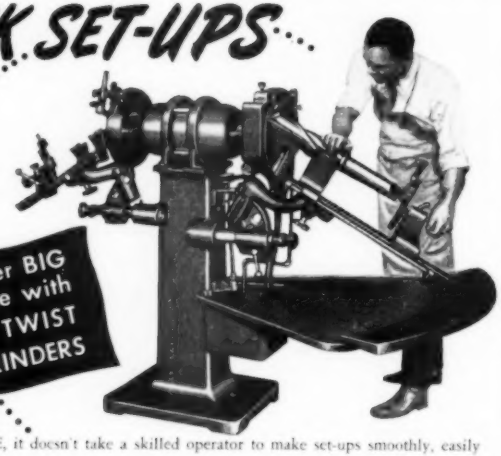
QUICK SET-UPS...



...another BIG advantage with YANKEE TWIST DRILL GRINDERS

With the YANKEE, it doesn't take a skilled operator to make set-ups smoothly, easily and quickly.

Whether drills are large or small . . . long or short . . . straight or taper shank . . . you can change easily from one to another almost without interruption. On the YANKEE, the drill rests in a "V" and regardless of size, always centers itself.

The YANKEE Twist Drill Grinder grinds quickly and accurately . . . uniform pressure control prevents burning. Adaptable also for 3 and 4 lip drills. Drills are ground with lips of equal length producing accurately sized holes. Yes . . . YANKEE-ground drills cut faster, drill straighter, and stay sharp longer. Before you buy . . . investigate the YANKEE!

Send us some of your drills. We will recondition and return them without cost to you. You'll see a real improvement in their performance when you use them.

Write for free illustrated Bulletin A-199.

COVEL MFG. COMPANY

BENTON HARBOR MICHIGAN

Our 75th Year

grave mistake not to take the foreman into consideration before making any changes. It is by his decision that the work is handed out. If, in the process of looking around and casting a bit of idle chatter, a mistake is found, or an improvement is thought of, there should be a small and immediate conference held to render a decision. With several "older heads" working on the idea, some valuable conclusion will be made and the work can continue.

I would look upon the foreman who didn't want "spectators" looking at the project under way as one who indeed needed the watchful eye himself. If, for reasons of personal gain, he did not want another to assist in the profitable working of the plant, he should not be in the position to gum up the works.

Let's make the proper changes, if they are found needed, at the most opportune time and continue to keep peace among our fellow workers. More hours are lost by verbally worrying about the other fellow's effort than by the major breakdowns that now and then plague all of us. It would be my idea to invite the interested parties to share in the task to better finish with a product that will prove that cooperation is the best way to solve any problem.

Jack Bell
Bakersfield, Calif.

•

TEN CENTS A CHANCE

Raffles in the shop can be tolerated the same as other functions just as long as they are not too frequent or set up as a professional game. Many men would like to have a spare mike or a new one but just can't get around to spending that much money at one time without making sacrifices. The person with surplus equipment, by raffling off his reserves, picks up an extra buck and has a little fun. Winning a mike on a ten-cent chance is not gambling in the true sense of the word; it is an investment.

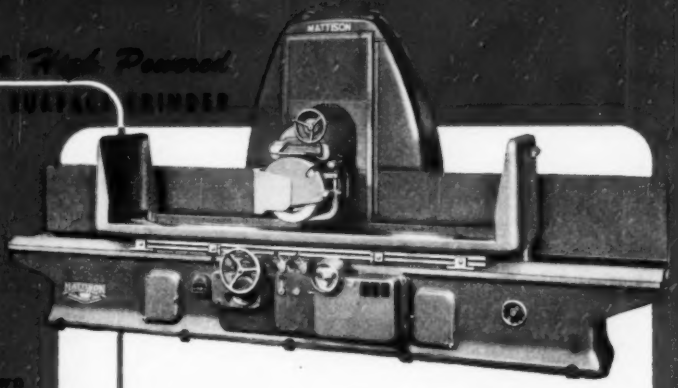
I have yet to work in a shop that did not have some sort of raffle or pool at least once a month. All sorts of merchandise from radios to baseball tickets have been put up as prizes. Weekly pools on sports or numbers are operated in most shops. In the office we had a pool based on the number of our pay-check to make up the best poker hand. An attempt was made at one time to discontinue this practice, but it continued behind closed doors (the men's room).

At one time the works manager and I had a discussion on how to

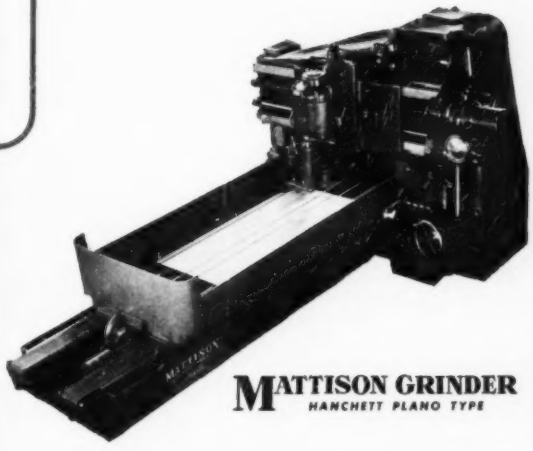
MATTISON GRINDERS

MATTISON *High Powered*
PRECISION SURFACE GRINDER

● Mattison Machine Works, Rockford, Illinois has purchased the line of Production Grinding Machinery formerly made by the Hanchett Manufacturing Company of Big Rapids, Michigan. These machines will supplement the well-known line of Mattison High Powered Precision Surface Grinders and enables Mattison Machine Works to offer machines for handling practically all of your Surface Grinding problems on a low cost, high-production basis.



For further information on any of the Grinders listed, ask for free circulars containing complete specifications and operating data.



MATTISON GRINDER
HANCHETT PLANO TYPE

Grinders now built by MATTISON

SURFACE GRINDERS: High-Powered, Precision, Horizontal Spindle—Rotary Type, Vertical Spindle—Rotary Automatics, Vertical Spindle — Reciprocating Table Type, Vertical Spindle — Plano Type, Horizontal and Vertical Spindle.

FACE GRINDERS: Traveling Table (Hydraulic) and Traveling Wheel.

DISC GRINDERS: Single Spindle, Double Spindle, Vertical Spindle, Automatic Single Wheel.

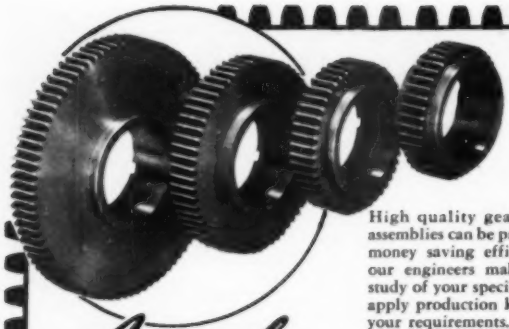
WAY GRINDERS: Vertical Spindle for dovetails and undercuts.

ABRASIVE-BELT GRINDING AND POLISHING MACHINES for wide steel sheets, strip steel, internal tube, etc.

● For years Mattison Machine Work- has successfully built High-Powered Precision Surface Grinders and will continue to build the same high quality into the entire line — through sound principles of engineering, precision manufacturing, careful workmanship and modern methods of production. Our reputation for service and careful attention to machines in the field will naturally extend over the complete line of Grinders now built by Mattison.

When in need of service or repair parts, present owners of Hanchett Grinders should contact Mattison Machine Works, Rockford, Illinois.

MATTISON MACHINE WORKS
ROCKFORD • ILLINOIS



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High quality gears and gear assemblies can be produced with money saving efficiency when our engineers make a careful study of your specifications and apply production know-how to your requirements.

Most of the executive personnel and shop machine operators at Amgears have a backlog of many years of experience in gear manufacturing and metallurgy, and a thorough knowledge of cost saving methods.

Your gear production is in good hands at Amgears.

Write now for your copy of Amgears Case Histories of particular interest to designing engineers and purchasing executives.

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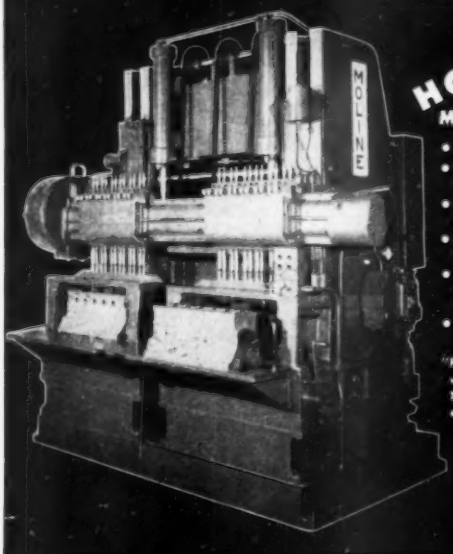
PRODUCTION UP... COSTS DOWN with... HOLE-HOG MACHINE TOOLS



- Multi-Spindle Boring
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- Special Multiple Operation Machine Tools

"Hole-Hog" does it better with 50 years of Machine Tool Engineering experience at your service.

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

handle this situation and he decided that as long as the cost of any raffle did not exceed 25 cents per person, or in a special pool like the World Series or a big fight it did not exceed one dollar, he had no objections if the proceeds were divided among the employees. He definitely objected to any outside interests soliciting the workers and resented the distribution of professional lotteries and pools.

Many men do not like to spend their idle time shopping for a scale or going out of their way to buy a rule to use in the shop even though they are badly in need of one. When an employee places a tool on the auction block, he is saving the buyer a special trip downtown and maybe some money too. The employer also benefits because the man has the extra equipment to perform his duties.

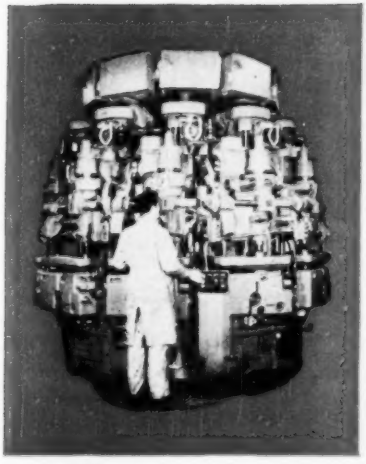
Frank J. Zarnowski
Rutherford, N. J.

•

Raffles, being a form of gambling, should not be permitted in the plant. It should be a fixed shop rule that all forms of games of chance be strictly forbidden. Observance of discipline in the shop makes it mandatory that this potential work-disrupter be stopped before it can gain a foothold. Raffles may be considered harmless fun outside the factory, but they carry trouble in their wake for the foreman or other executive who permits them in the shop.

While a rose by any other name may smell just as sweet, gambling by any other name (such as raffles), smells just as malodorous. Where all forms of gambling in the shop are prohibited by established shop rules, it will be easier to keep them from finding root in the shop. Disciplinary regulations covering infractions of the shop rules relative to establishing of lotteries or other forms of games of chance will nip such schemes in the bud and eliminate potential headaches for the foreman.

Tagging the qualifying word "mild" on gambling does not lessen its harmful effect on shop discipline. The most important purpose of shop discipline is simply increasing productive efficiency. To increase efficiency in the shop, managerial policy should be preventive rather than punitive, as applied to gambling. Hence, alert management should attack disciplinary problems, such as gambling, in their incipient stages before they emerge as problems. Similarly, all disciplinary action should have a positive rather than a negative effect, that is, it



"One costly shutdown after another dogged our machine shop operations until we finally learned the reason. Our circulating oils were foaming and oxidizing which caused sludge formation and critical corrosion damage to our equipment.

"A Cities Service Lubrication Engineer suggested a change in the circulating oils. We tried a Cities Service Pacemaker 'T' oil. These multi-purpose oils are fortified against foaming, oxidation and rust.

"Results were immediate. Costly shut-downs were reduced by over 200%. Efficiency of the whole line improved and quality of production was substantially stepped up."

Free—If you use cutting oils, write for our booklet "Metal Cutting Fluids." Write Cities Service Oil Company, Room 478 Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE PACEMAKER "T" MULTI-PURPOSE OILS

★ For Hydraulic systems ★ For Air Compressors ★ Other circulating systems

CITIES SERVICE

SIBLEY

MODEL C-20

DRILLING MACHINE

QUALITY

Over 70 years experience in the manufacture of drilling machines provides highest quality standards. All parts except motors, switches, V-belts and bearings produced within our own plants. High tensile strength castings made in our foundry under constant laboratory analysis control. Machining operations and assembly performed by master craftsmen.

ACCURACY

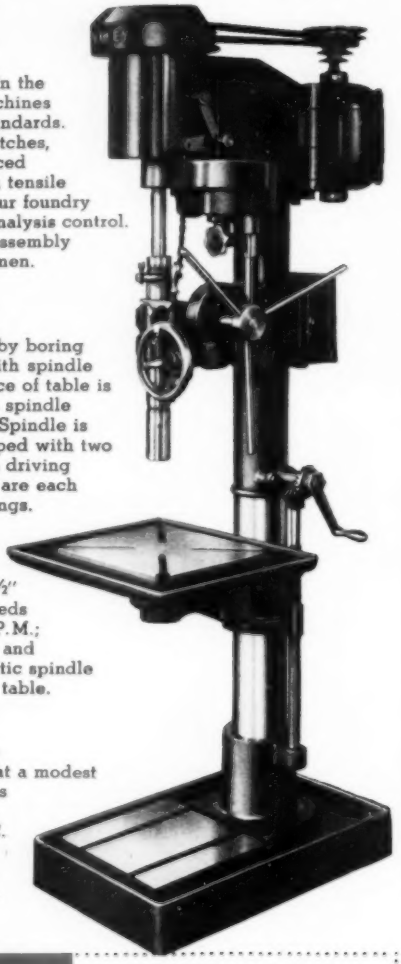
Table alignment is assured by boring table arm after assembly with spindle furnished on machine. Surface of table is maintained at right angle to spindle within .0007" in six inches. Spindle is precision ground and equipped with two ball thrust bearings. Spindle driving sheave and large back gear are each supported by two ball bearings.

FEATURES

20" swing; power to drill 1½" in mild steel; 8 spindle speeds ranging from 65 to 1360 R.P.M.; geared power feeds; simple and convenient controls; automatic spindle stop; rectangular oil groove table.

PRICE

Extraordinary performance at a modest cost. Model C-20 machine as illustrated complete with 2 H.P., 3 phase, 60 cycle, A.C. motor and magnetic type starting switch . . . **$919.75.** F.O.B. South Bend, Indiana.



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should encourage workers, including those particularly affected by it, to cooperate rather than to resent the action and resolve to retaliate. The whole disciplinary phase of management is likely to be unsatisfactory if it results in disorganized employee morale and feelings of resentment and persecution rather than recognition of the reasonableness and propriety of disciplinary action.

Where gambling in the shop is discovered, in violation of existing shop rules, being a disciplinary problem, it should be handled on a personal basis. The most frequently used device is the interview, and its purpose should always be to secure the agreement of the offender upon a future course of action that will increase cooperation. What is necessary is that the interview be so conducted that the offender is led to see, first, the reason for the rule, and, second, his own interest in its observation. Management must be represented not as a self-imposed dictator but merely as the enforcement agency, operating in the interest of all employees.

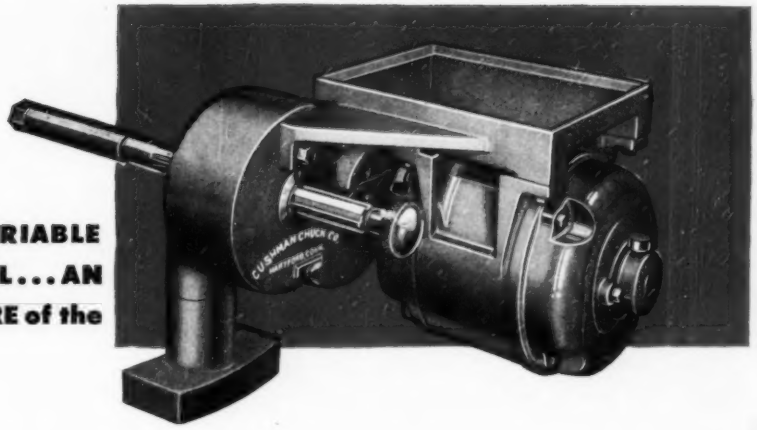
Minor infractions of shop rules, if permitted, may lead to a general tendency on the part of the workers to regard all controls imposed by management as unfair, improper, and unreasonable, and thereby tend to disrupt productive efficiency. This condition was realistically emphasized by the following case. I knew a foreman who came up from the ranks. This man, who headed up a group of machinists in a hardware manufacturing plant, believed that the key to successful foremanship was popularity with his men. He drank beer with the boys every afternoon after work to show that he was still a good fellow, and on the job winked at their violation of plant rules. This man eventually had to be replaced. Not only was the quality of his outfit's work slipping, but it was discovered that his men did not respect him. Being a good foreman is not just a matter of being popular, and condoning infractions of shop rules. You can't play with fire and not run the risk of getting burned.

Harry Kaufman
Philadelphia, Pa.

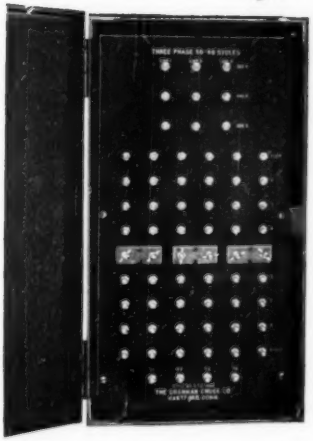
•

If we were to stop employees from selling chances, we would do more harm than good—especially if such raffles are for a good cause. If, however, one particular employee makes it a habit, I think it should be discouraged, especially if it is for self profit. Usually the winner of a chance or raffle collects only a part

"Cushmatic" VARIABLE TORQUE CONTROL... AN EXCLUSIVE FEATURE of the



CUSHMAN *Power* WRENCH



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of the money or a prize worth only a percentage of money collected. I personally would have no objection to a man for chancing off his tools if he had no further use for them and he did not ask more than they were worth.

It would be a hard thing to stop raffles even in shops where all gambling is prohibited. It is a much better plan to have these raffles and chances right out in the open so the foreman can arrange with the employees to have them paid for and run off at lunch-period. In doing it in his way there would be no claim of fixing.

In every shop some kind of chances are run—often in the front office. In our department the employees chip in 25 cents a week and have a drawing every Friday. Each man puts his 25 cents in a special slotted can together with his name and clock number and these are checked off at the lunch period just before the drawing.

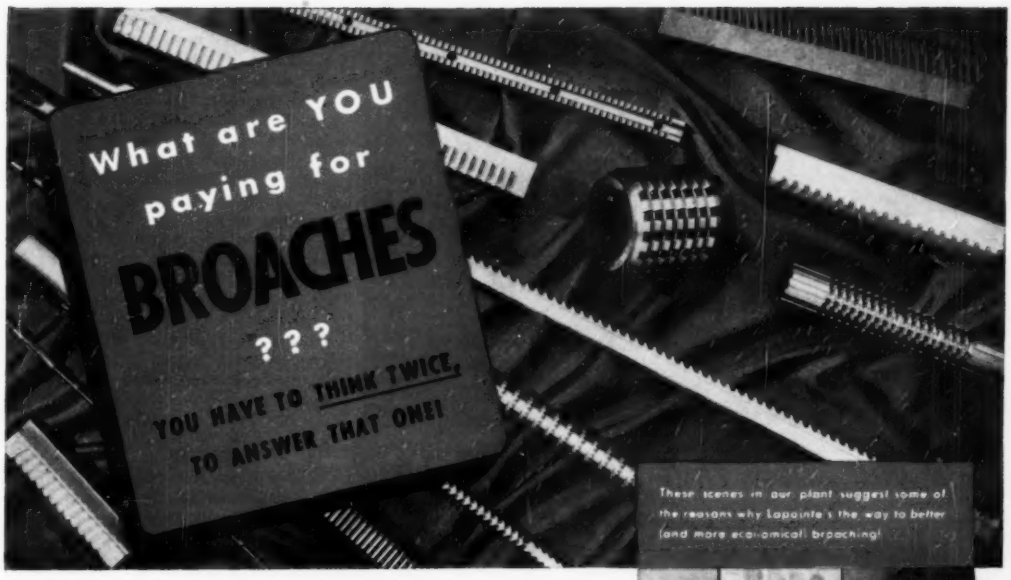
There are very few employees who do not participate in some kind of lottery, and it is the majority we must consider in this problem. If we were to stop all games of chance in the shop it would be like giving these employees a kick in the pants. To my way of thinking one pat on the back is more effective than five kicks in the rear. In these days we must think in terms of the employees' interests to get things done. If the foreman is dissatisfied with the method employed in running these chances he should suggest—not order—on improvement. A receptive attitude on our part, a blending of thoughts, and a frank discussion with the employees will determine the best method to run these affairs to everyone's satisfaction without loss of time or production.

In the final analysis, it is much better to have the foreman or the supervisor help so there is no loss of time, no ill feeling or discontentment and everyone's interests are protected.

A. E. Salmons
Philadelphia, Pa.

•

Everyone is a gambler at heart. Life itself is a gamble. Gambling can never be stopped, even if it is illegal. Whether we should allow it throughout the factories of the nation and in the offices is the $64 question. Those who really go in for raffles, betting on horses, ball games and the like will say, "Why not?" Others who only like to gamble over cards will not care whether we let it go on or not. A few of those who gam-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ble in other ways, which involve much besides money, will say "No!"

It certainly does waste productive time. It wastes valuable manhours and the output so badly needed to keep costs low. But if the boss says it is okay, why worry about a few hours of wasted time? Probably the boss spends too much of the time he should be working in drinking cokes or playing golf.

The company, of course, can't continually afford to have its men waste their time, but the foreman and his workers don't care as long as they have jobs. Someday there will be a day of layoffs due to loss of business because everyone played too much.

Raffles are not wrong . . . they are only wrong when conducted on company time. If we are to stay together as an industrial nation, we must produce. Eight hours of work for eight hours of pay. Perhaps you want to be told how long to work and for whom. It will come if we continue to hold raffles on valuable industrial time.

Perhaps the best thing this country could do would be to legalize betting and to collect a good stiff tax on it . . . carry it down to all gambling gains or losses. Of course, it would be hard to collect, but so are a lot of other taxes. Why let the revenue from this pleasure slip through the government without some "take" in order to help defray the high cost of governmental spending?

Foremen . . . if your men want to hold raffles, let them do it but not on company time. Don't say "no" and antagonize them, but ask that they refrain except at rest periods. Get your men to subscribe to and respect your wishes. Keep your production costs down, for if you don't, you won't have any need to worry about a raffle.

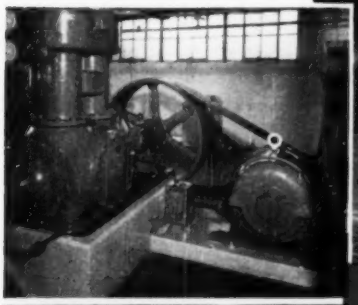
Charles D. Townsend
Centralia, Mo.

•

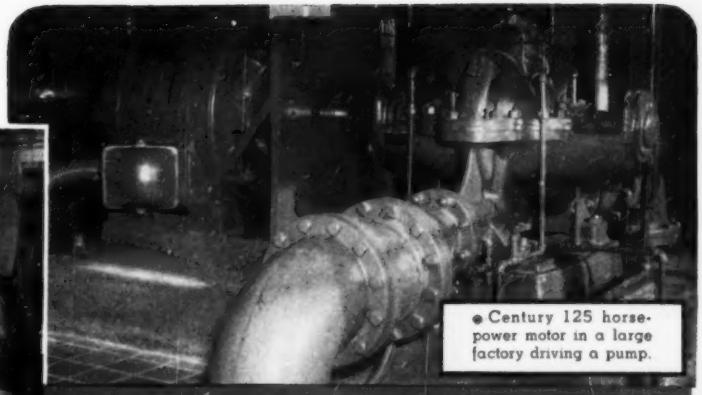
This subject has been brought up in several plants where I have been foreman. The general rule has been to restrict raffles in some places and positively prohibit them in others.

I have seen several individuals make a practice of running, say, a couple of raffles a year in the shop. In one case, a plant watchman who got rather chronic at it. He had a confederate operate with him on the deal.

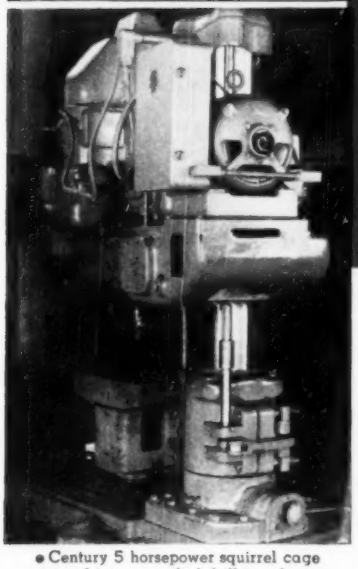
The confederate won a watch several times; then it came up for raffle again. On the third time up, the watchman got his walking papers. All raffles were tabooed in that shop thereafter, excepting the



• Century 100 horsepower squirrel cage motor driving a refrigeration compressor.



• Century 125 horsepower motor in a large factory driving a pump.



• Century 5 horsepower squirrel cage motor driving a radial drill in a large metal working department.

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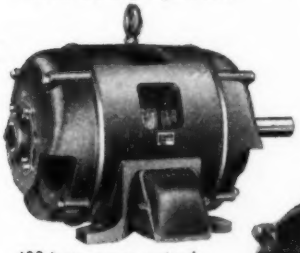

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sale of regular church, lodge, or service-club raffle tickets.

My personal view on the matter is that I would not frown on a group in the shop holding a friendly raffle among themselves to dispose of some tool in good condition that the owner has no further desire to retain in his possession. However I would want to be sure the tool or article was in good condition. Otherwise it might have a hidden fault that would show up later. There could be three victims to such a deal. For instance, if the mike is defective at a certain point in measurement, the buyer, the firm and myself are the goats if a serious mistake comes up from its use. One thing I have permitted and seen favorable results from is the small pool on baseball or football when fever heat is high on the finals.

The boys have shown their appreciation for this favor and it promoted good-will toward the firm and myself.

Henry Rasmussen
Niagara Falls, N. Y.

•

One way it used to happen, the raffler would have a list of fellows in the shop and on the list also would be several of his relatives and acquaintances, and of course if one of these people's number turned out to be the winner, the prize simply remained with the raffler. With six or seven of these dummy chances in his favor, the prize often stayed with him.

Raffles do of course consume a bit of time, but I believe that a boss should buy a ticket and join in the bit of fun it creates, because in my mind it creates good fellowship, makes people laugh a bit, puts them all in a good humor, takes their mind off the job for a little while, and then they really go to work and more than catch up on the little time that has been lost.

Nobody bothers very much in a shop when a raffle is believed to have been fixed, say if the prize is a turkey or a couple of chickens or similar. Whoever wins considers himself lucky. It's taken as a sporting chance.

But if you really want to raise some real money for a sick employee or the Red Cross, do what is done regularly in a large plant. Put up first, second and third prizes of $50, $25, and $12.50, with tickets costing $1 each.

We used to take up a voluntary collection for these organizations and we got one year from around 450 employees $214 in a few one-dollar

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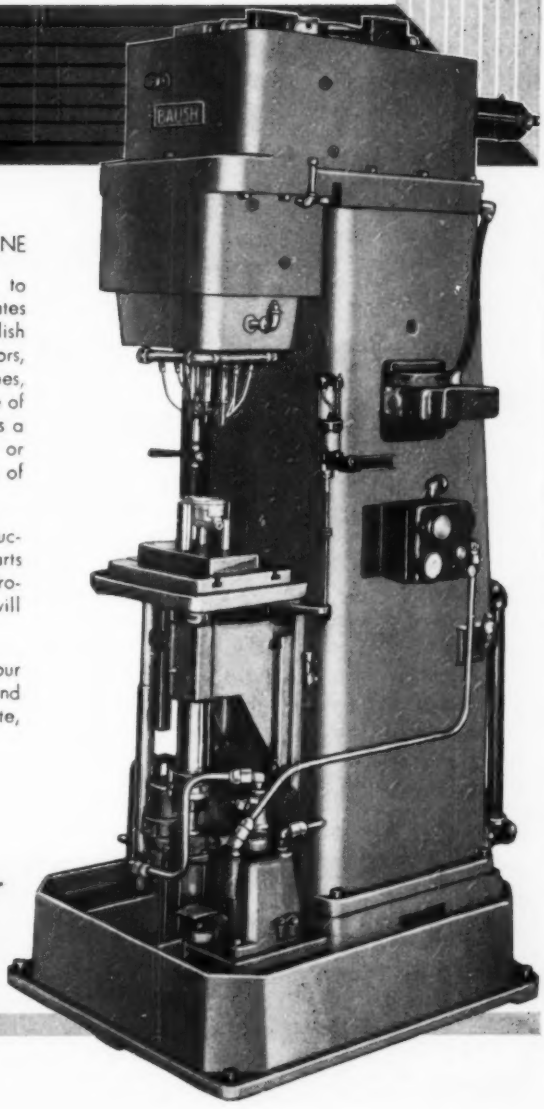

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contributions, the rest in 75¢, 50¢ and quarters.

The next year we put up the prizes of money stated previously and we had after the prize money had been paid out all of $575.50 clear profit. Some of the fellows bought three and four chances, and as anyone could buy a ticket lots of their friends took chances also. We had approximately the same number of employees both years. The chances were drawn in the shop out of a bowl by one of the office girls in the presence of all the ticket holders, and of course this was on the up and up, no monkey business.

If you closed down all places where gambling—games of chance are of course a mild form of gambling—you would not only close down places where big time gambling takes place, but the vast majority of church social bazaars, and lots of deserving causes would be worse off.

I regard them as harmless fun, plus the fact the resultant cash has been extremely helpful in lots of cases of sickness, and for the life of me I cannot see where they can possibly cause any sort of headache to any boss, particularly as it seldom happens there is a raffle more than once a week, and often only about once a month.

Can they be stopped? Yes, I think so, by very strict supervision at least on work time, but as soon as the edge had worn off and officials had relaxed, they would appear again and I believe that it is better to condone them within reason and for the supervisor to enter into the spirit of the little fun that came with them, buy a ticket, join the fun for a few minutes, and then back to work again, a little the better for the interlude.

Arthur Silvester
Niantic, Conn.

•

TEN O'CLOCK SCHOLAR

A worker, in office or shop, who makes a habit of not being on time is probably a square peg in a round hole; or indifferent regarding advancement and the reputation he is building for himself, which will prove a boomerang later; or not interested in keeping physically fit by proper diet, recreation and rest; or just plain "lazy." If the latter, it is questionable whether a "Dutch Uncle" talk will make him see the effect of his actions on his employer and fellow workers.

Most companies find it advantageous to have printed rules which are given to employees when hired, thus creating a better understanding. The

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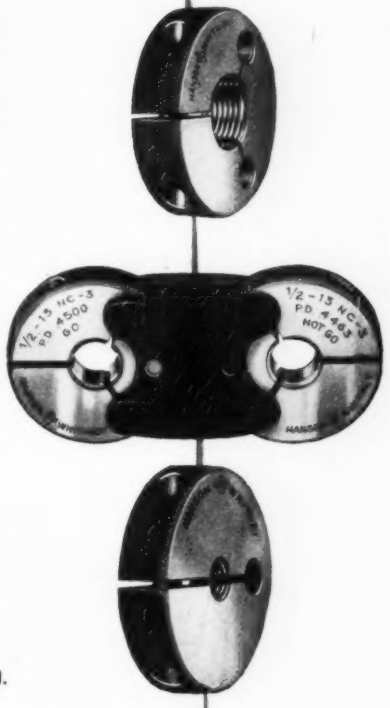

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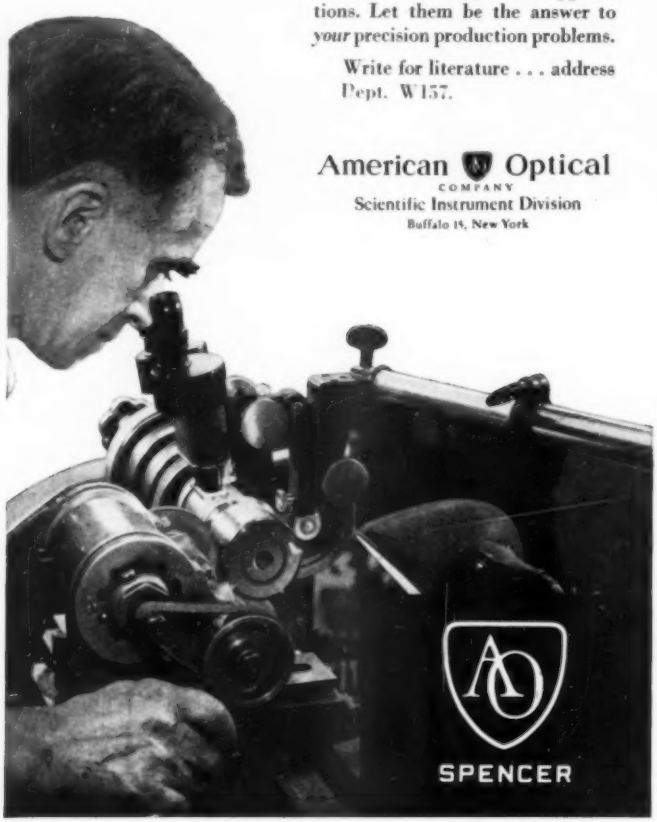


employees know in advance just what is expected of them and the company's procedure in case disciplinary action is necessary. Being suspended several days without pay for a stated number of latenesses within a pay period, effectively cured a number of laggards in our establishment because it hit them where it hurt—the pocketbook.

Two weeks in a civilian military training camp transformed one of our "Ten O'Clock Scholars" into an alert, ambitious man. The change was miraculous.

The prize excuse brought to my attention was submitted by a young lady who did not report for work Wednesday because she was so unnerved by seeing a mouse in her kitchen the night before.

A. Tomlinson
Philadelphia, Pa.

•

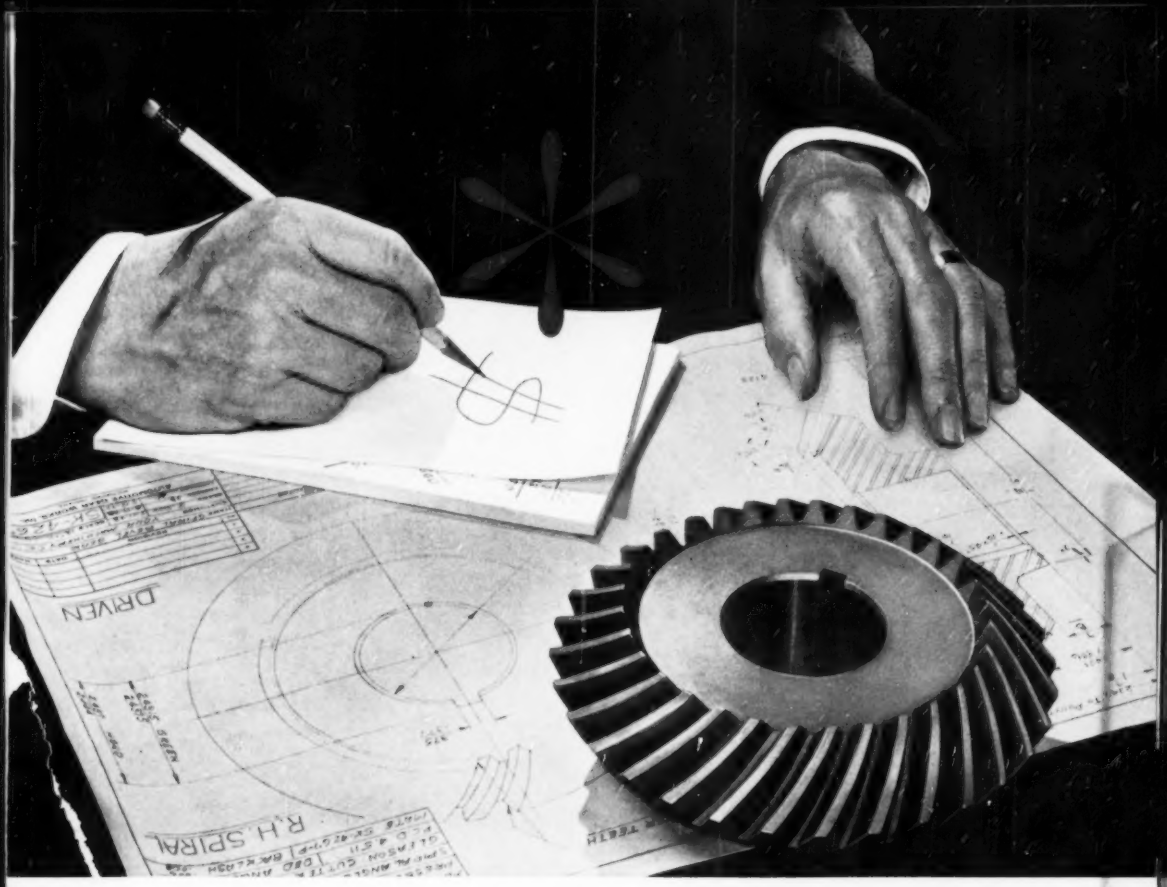
Ed certainly has a job on his hands! For one man to continually come in late as often as Harry does is a distinct hazard for the plant morale. If he gets away with it, all the other boys will be doing it.

It is probably too big a job for Ed to handle alone. This is where a plant personnel diplomat comes in handy—somebody who is entirely separate from the part of the shop in which Harry works. Ed is good natured and a "Good Scout" and Harry proceeds to capitalize on his good nature. Harry probably does not realize just how his actions affect shop morale (or does not care). Harry figures that Ed will not fire him and proceeds to spend more time on thinking up another plausible excuse instead of making an effort to be on time.

If the personnel man cannot get him straightened out some other way of throwing a good scare into him might be worked out. Firing him might be a rather drastic action but it is is sometimes better to fire a man than to have the plant morale completely disrupted.

If the next time Harry comes in late the time clerk would hand him a note for him to call on the personnel man or the "Big Brass" in the front office the shock and the surprise of receiving a summons might have the right effect which the interview will cinch. Harry figures that his tardy actions are personal between him and Ed. To find that the Front Office is interested might be all that is necessary to change his habits.

Chas. O. Rankin
Ontario, Calif.



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And how much will the manufacturer respect your delivery requirements?

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1 No flange. No collar. It's *different.*

2 Easy on — easy off.

3 Just tighten the screws that wedge the bushing. Simple, isn't it?

4 Always a perfect fit on shaft — tight as "shrunk-on."

5 Complete range of sizes. A, B, C and D grooves, *in stock.*

6 Try it—and you'll standardize on it!

DODGE MANUFACTURING CORPORATION • MISHAWAKA, INDIANA

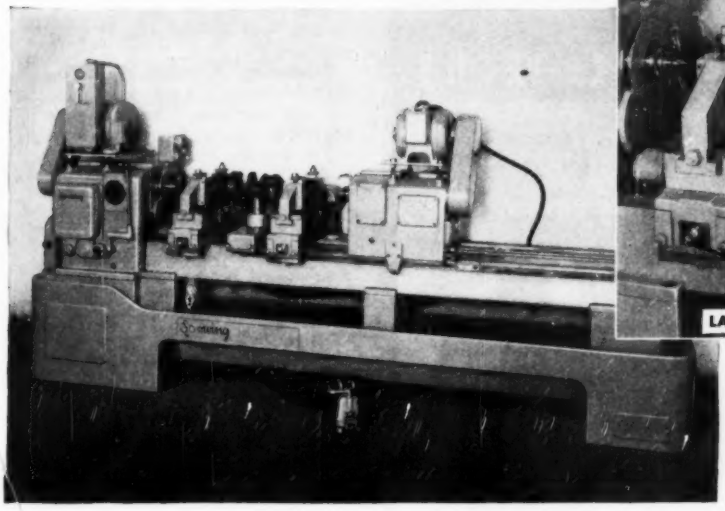
CALL THE TRANSMISSIONEER, your local Dodge Distributor, for information on new and better methods of transmitting power. Look for his name under "Power Transmission Equipment" in your classified telephone book.

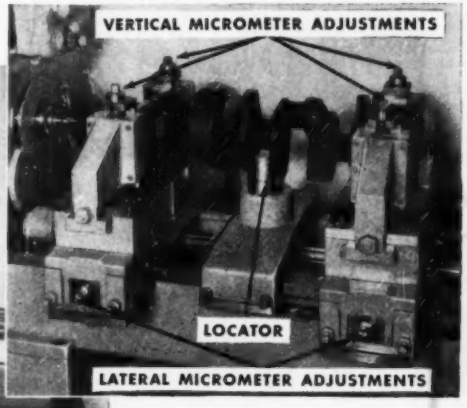
DODGE
of Mishawaka, Ind.

NAME PLATES FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK





Machine shown with Coolant Guards removed from Drilling Spindles

MODEL "CS" AUTOMATIC CENTERING MACHINE CENTERS CRANKSHAFTS IN RELATION TO CENTER OF MASS BALANCE

Problem: Center automatically various types of crankshaft forgings in relation to center of mass balance.

Solution: The Model "CS" Automatic Drilling and Centering Machine selected for this job was equipped with special air operated vises having cross and vertical micrometer adjustment for the clamping jaws.

In operation, the first crankshaft forging of the lot is centered with all jaw adjustment dials set at zero. A crankshaft is then centered and tested for mass balance in a balancing machine, after which fine adjustments are made on the vise jaws. The machine is then ready to proceed with the centering operations on the run of a particular type of crankshaft.

Referring to the close-up view of the vises, note that each of the four jaws has independent vertical micrometer adjustment, while the cross or lateral adjustment is made with a single micrometer adjusting screw which operates the cross slide fitted to the body of the vise.

Located between the vises is a spring-operated locator which positions the crankshaft and maintains accurate depth of centering in relation to cheeks of one of the line bearings.

Engineered jobs are our specialty, and our staff is at your disposal to assist in solving your problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

QUICK ACTING
JOHNSON FURNACES
REDUCE
TOOLROOM BOTTLENECKS

Heat treat high speed steels, tools and dies in your own plant at low cost

Reduce unnecessary lost time waiting for tools and dies. Heat treat high speed steels, harden high carbon steels, braze carbide tipped tools in your own plant. *Quick Acting* JOHNSON Hi-Speed Furnaces are ready for action to produce high uniform temperatures FAST and at remarkably low cost. Pay for themselves by saving time and gas. Wide temperature range easily regulated with accuracy. Write today for complete literature describing all *Quick Acting* JOHNSON Furnaces. There is a size to meet every toolroom requirement.

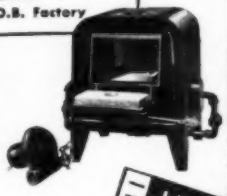
Furnaces described are complete with Carbofrax Hearth, G. E. Motor, and Johnson Blower.

QUICK ACTING

JOHNSON No. 120 Hi-Speed
1300° F. in 5 Minutes
2300° F. in 30 Minutes
Firebox 3 x 7¼ x 13½. Two burners
$145.50 F.O.B. Factory

QUICK ACTING

JOHNSON No. 70 Hi-Speed Bench Furnace
2230°F. in 30 Minutes from a cold start.
Treats all steels. Firebox 3 x 7¼ x 9. Two burners
$105.50 F.O.B. Factory



QUICK ACTING

JOHNSON No. 130A Hi-Speed
For steels requiring 1400-2350° F.
Firebox 7 x 13 x 16½. Four burners.
$295.00 F.O.B. Factory

JOHNSON GAS APPLIANCE CO.
589 E. AVENUE N.W., CEDAR RAPIDS, IOWA

COMPLETE JOHNSON CATALOG
Write for FREE Catalog describing all time saving, cost cutting JOHNSON Furnaces for pot hardening, melting, annealing, and heat treating purposes

TO THE EDITOR

SIR: I have been reading your fine magazine for a long time and I am especially interested in the Round Table Discussions. These case studies take in production, quality, safety, and most important of all, various viewpoints on dealing with people. I believe the following methods will answer most of these problems.

Production & Quality: Use the friendly approach to get the job done. Let the employee know he is an important cog in the gear. Never tell a man he is wrong or he will rankle with discord and ill feeling. Use the power of suggestion rather than the direct order. Give the employee a good reputation to live up to. Set up a friendly challenge, ask a favor and be sincere in your encouragement. Be interested in the employees, they will be interested in you. Be a good listener and let him know you appreciate a job well done.

Safety: We must make sure a man or woman knows all there is to know about the job you assign them to. Safety should begin at the same time as the job instruction and is as much the supervisor's job as quality and production. If properly trained the man who excels in quality will also be a good man on safety. In training a man in safety measures, or in safety equipment make sure you use them yourself when you teach him.

Correct a Fault: Always praise some other good quality before finding fault and admit your own mistakes before criticizing others. Praise each improvement and every step of progress. Let the employee know you are there to help him and make the fault seem easy to correct. Get the employees' views on corrective measures to prevent a recurrence of mistake.

Suggestions: Be thoughtful of the employee's feelings and considerate of his ideas. Persuade him that with his ideas joined with your own you both feel you can accomplish the new ideas you seek. Frank discussions and blending of thoughts will keep the employees thinking rightly. Develop a desire to see the employee's point of view as well as your own angle. Praise and encourage the employee and thank him for every idea "if used or not." We must recognize the fact the man on the job sees some things we ourselves would not

Combined operations save money

Automatic drilling and tapping machines increase output per man-hour, reduce handling, make parts uniform and accurate

Dear Sir:

The man and the machine cost 2-2/10¢ for 7 operations on each drive housing. That makes the average cost per operation about 1/3¢.

The man and the machine cost 1-8/10¢ for 19 operations on each typewriter part. That makes the average cost per operation about 1/10¢.

Cost basis is conservative

For both costs we made these 3 assumptions: 1) The man would receive a generous hourly wage. 2) The machine would operate at 80% efficiency. 3) The entire investment for machine and tooling would be amortized over the first 6000 hours of operation, a fraction of the profitable life. No power or overhead.

Why costs are low

The main reason: One machine with one operator performs many operations per hour. (In these cases: 1820 operations per hour on the drive housings; 3344 operations per hour on the typewriter parts, both based on 80% efficiency.)

Other reasons:

You have less handling because of fewer chuckings.

You reject few parts because —

Operations are in exact relationship. (In the same chucking of the typewriter part, 19 holes are drilled.)

Operations are in exact location. (For the drive housing, bushings in piloted plates guide every tool except the tap.)

Machining is uniform. (Units with automatic cycles and cam feeds perform every operation.)

We tool each machine and run off samples for your approval before we ship the machine. Every part will be exactly like the samples, assuming (naturally) that you maintain the machine and tools properly

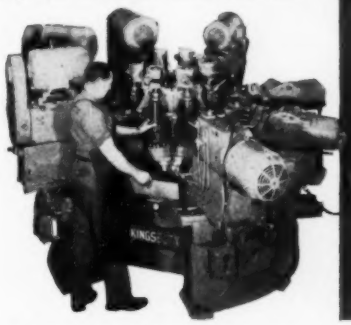
How much can you save?

To learn *your* savings, ask us for proposals. Ask others, too. Since this is our sole business, our proposals should certainly compare favorably with others. (We do, however, remember one man who thought all competitive proposals for one job looked equally good. We finally got the order on the basis of our Dun and Bradstreet rating. That is one way to decide.)

If you want a proposal, just send our Mr. L. A. Carll a print of a high production part with drilling and analogous operations. Tell him the operations and hourly output you need. Or ask him for free bulletins that show 40 setups.

Sincerely,

Kingsbury Machine Tool Corp.
40 Laurel St., Keene, N. H.



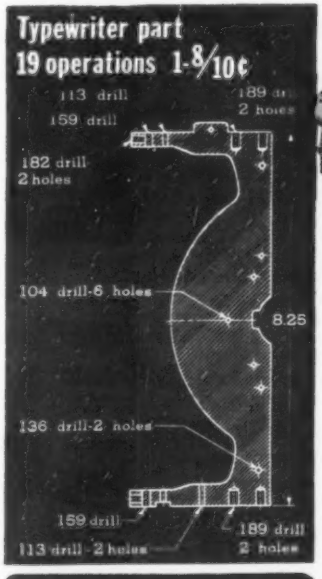
325 PARTS AN HOUR GROSS. This automatic indexing machine performs 7 operations progressively on the governor hole.

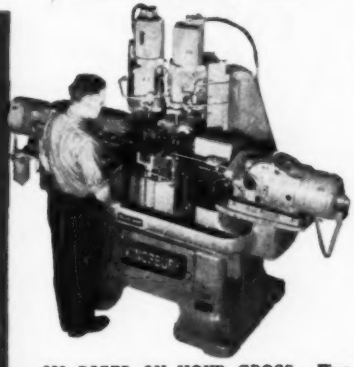
- **Each automatic unit is horizontal and operates one tool. There are 3 combination tools — 2 combination drills and countersinks and one tool that spot faces both walls.**

- **Bushings guide every tool except the tap.**

Ball bearing bushings guide the combination 1.078 drill and countersink, the 1.109 reamer and the combination spot face.

The combination .359 drill and countersink and the .375 reamer pilot into the large hole. Other bushing carriers pilot onto the fixtures.





220 PARTS AN HOUR GROSS. Five units operate 19 drills on the part from 4 directions in one chucking. There is no indexing.

- **The 2 horns point upwardly. Two vertical units drill the .182 holes.**
- **Horizontal units at left and right have multi-spindle auxiliary heads to drill the holes on the end of each part.**
- **The horizontal unit at the rear has an 8-spindle auxiliary head to drill six .104 holes and two .136 holes.**
- **Here is the cycle (about 16 secs.):**

1. The man loads the fixture and trips a lever.

2. The horizontal units operate and then trip the vertical units.

3. The vertical units operate. (In that way vertical drills do not clash with horizontal drills.)

4. The man unloads the fixture.

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES

for Low-Cost High Production

consult JOHNSON BRONZE Engineers on bearing problems

WHILE fully 90% of your sleeve bearing requirements are available from stock, Johnson Bronze can furnish all styles of sleeve bearings for special applications. Johnson engineers are working constantly with manufacturers on research and on designing bearings for specific uses. They are capable and ready to advise you on the right style and correct design for economical and efficient service on any equipment you produce. These bearing specialists have designed Johnson Bearings for other manufacturers at 20% to 50% of the cost of other types and have helped reduce installation and maintenance costs. If you have a bearing problem of any kind, consult the Johnson Bronze representative in your territory about this engineering service, or write direct.

BRONZE and BABBITT

STEEL and BABBITT

SHEET BRONZE
Plain or graphited

CAST BRONZE
Plain or graphited

BRONZE ON STEEL
Plain or graphited

Johnson Bronze
SLEEVE BEARING HEADQUARTERS
18 SOUTH MILL STREET · NEW CASTLE, PA.

see unless we worked on that job for an extended period.

Grievances: A smile and a pat on the back will go a long way to cool off the aggrieved. Talk to the employee, the union chairman, or the shop steward as you would to your best friend. Be friendly, listen attentively and remember these words —It's not "who's right" but rather "what's right."

A. E. Salmons
Philadelphia, Pa.

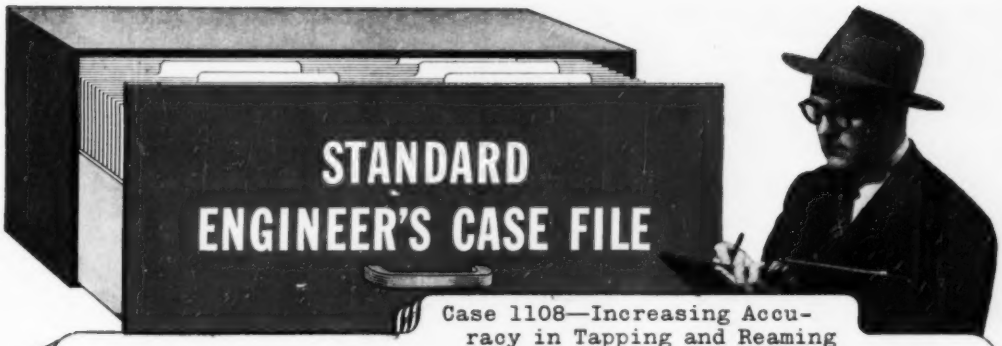
•

We have noted in the July 14, 1949, AMERICAN MACHINIST, page 188, a letter from C. E. Hoffman, Oklahoma A. and M. College, Stillwater, Okla. Statements made in this letter are incorrect and have no basis in fact. In view of this, we are requesting that you print our letter, in full, as a clarification and correction of the statements.

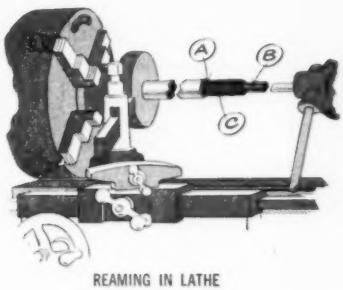
As the Technical Adviser of the Halliburton Oil Well Cementing Co., this writer is in administrative charge of the Engineering, Production, Materials, and Transportation Departments of our company. The statements to be made herein are specifically on behalf of R. M. Hansen, works manager in charge of production, and John Guest, chief engineer of this company. Mr. Hoffman's letter represents a gross injustice to our Company and to these men and their departments especially.

Our objections to Mr. Hoffman's letter are specifically:

1. The statement that the personnel director of this Company said 'that his organization had found it necessary to employ a liaison man to work between the engineering department and the shop—.' To prevent impossible pieces of equipment being sent from engineering to shop and having no practical value to the Company is GROSSLY INCORRECT.
2. This Company does not have a man carrying the title of 'personnel director' as referred to by Mr. Hoffman. Furthermore, to the best of our knowledge, Mr. Hoffman has had no experience whatever with our Company.
3. We have a highly competent engineering staff, who do not 'cook up' equipment impossible to be fabricated in our shops, nor do they produce designs which are of no practical value to this company. Furthermore, no designs of either new or improved equipment are ever placed in the shops on production until all details have been built on an experimental basis and thoroughly tested.
4. We employ, both within the engi-



Case 1108—Increasing Accuracy in Tapping and Reaming



REAMING IN LATHE

When tapping and reaming gun barrels from steel treated to a Rockwell of 35-36, Calol T. R. Compound diluted with a transparent cutting oil obtained better accuracy and made tools last longer than any other lubricant. The 25-inch barrels were machined to an inside diameter of 1.045 and concentricity was held to under .005. Calol T. R. Compound also helps solve problems of scuffing of work, and welding of work to tool in drawing, forming, punch press and other operations.

A. Contains two very active extreme pressure additives, prevents tearing of metal, promotes clean, smooth work finish, and allows faster speeds, increasing production.

B. Has consistency of a No. 0 grease . . . may be diluted with active Calol Cutting Oils without losing extreme-pressure qualities. Dilution with Calol Vistac Oil, aids adhesive characteristics. Light engine oils may be used.

C. Easily applied with brush or swab.

Case 1146—Selecting the Correct Cutting Fluid

MULTIPLE SPEED RADIAL DRILL

In tests on machine tools of all different types, the Calol Cutting Fluid recommended for each operation produced fine surface finish on work. This is because recommendations for Calol Cutting Fluids are made from actual working results — tests made on a special drillpress, the Drilling Torque Tester — and the results recorded by electronics. Calol Cutting Fluids come in four general classes: mineral oils, ready-mixed compounded oils, concentrates and soluble oils.

A. Made for every machining operation — from toughest broaching to simple grinding.

B. Lubricating, cooling and flushing qualities assure longer tool life and better work finish.

Calol Cutting Fluids also give maximum rust protection to machine tools and work. The soluble oils in the line mix with water easily and form strong, stable emulsions.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, N. J.—Chicago, Ill.

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

CALOL

Trademark Reg. U.S. Pat. Office

WENDT SONIS

Line of Reamers

IS COMPLETE

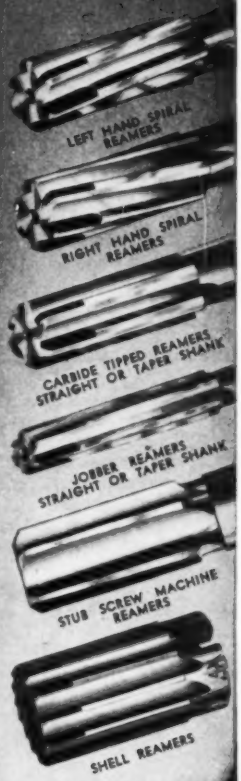
CARBIDE FULL LENGTH FLUTE REAMERS STRAIGHT OR TAPER SHANK

- COMPLETE RANGE OF SIZES
- WIDE SELECTION OF STYLES
- HARDENED STEEL SHANKS
- ADVANCED DESIGNS

The W-S line of reamers is so complete that they can meet practically all your reaming requirements. For example, W-S Straight Shank Reamers style SSR are available from stock in 37 sizes ranging from $\frac{1}{8}$" to $1\frac{1}{2}$". Similar ranges of sizes are available in 12 other types of standard reamers. Quick delivery can be obtained on standard reamers with special diameters and tolerances. "Engineered for the Job" design increases production and saves on tool costs. You get longer wear—greater accuracy when you select Wendt-Sonis Reamers for your requirements.

Free! W-S SPEED AND FEED CALCULATOR

Quickly figures feed and speeds on reaming and other operations. Write, WENDT-SONIS COMPANY, Hannibal, Missouri—580 North Prairie Ave., Hawthorne, Calif., or 459 W. Randolph, Chicago, Ill. Warehousing Facilities — Eastern Carbide Corp., 909 Main St., New Rochelle, N. Y.


LEFT HAND SPIRAL REAMERS
RIGHT HAND SPIRAL REAMERS
CARBIDE TIPPED REAMERS STRAIGHT OR TAPER SHANK
JOBBER REAMERS STRAIGHT OR TAPER SHANK
STUB SCREW MACHINE REAMERS
SHELL REAMERS

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL BITS

neering department and within the shops, men who do coordinate the efforts of both departments and no conflict exists as is intimated by Mr. Hoffman. We not only have men within the engineering organization of this Company who are competent machinists, but we have men within the production set-up who are competent engineers.

Wm. D. Owsley
Technical Adviser
Halliburton Oil Well
Cementing Company
Duncan, Okla.

•

Sir:

I have just finished reading June 30 *A.M.* and am personally interested in the article, "Has the Nation Forgotten?"

Henry Rasmussen's letter hits a tender spot. I, too, am an all-around machinist with fifty years experience in every type of metalworking; experience which apparently means very little!

At the age of 65 I was informed that company policy required that I must retire. My salary was $4,000 and apparently it was well earned. My ability as a machinist was not questioned—only my birthday. I was chief machinist for the Alaska Division of Pan American Airways for ten years, and also earned a ten-year pin from the Boeing Airplane Company. I hardly think that you could consider me a "floater."

Shortly after my retirement, I noticed an advertisement for civilian machinists at the Sands Point Navy Airplane Base. I sent in an application and a request for an interview. The application was returned with a red mark around my birth date and a notation saying that they did not employ anyone over 60 years of age.

While I have a considerable sum set aside in savings bonds, it is not sufficient to support me. Social Security payments are so small that I find it necessary to cash some bonds whenever a major expense, such as fuel or clothing, must be met. If a spell of illness came along, God help me! My bonds would never see me through.

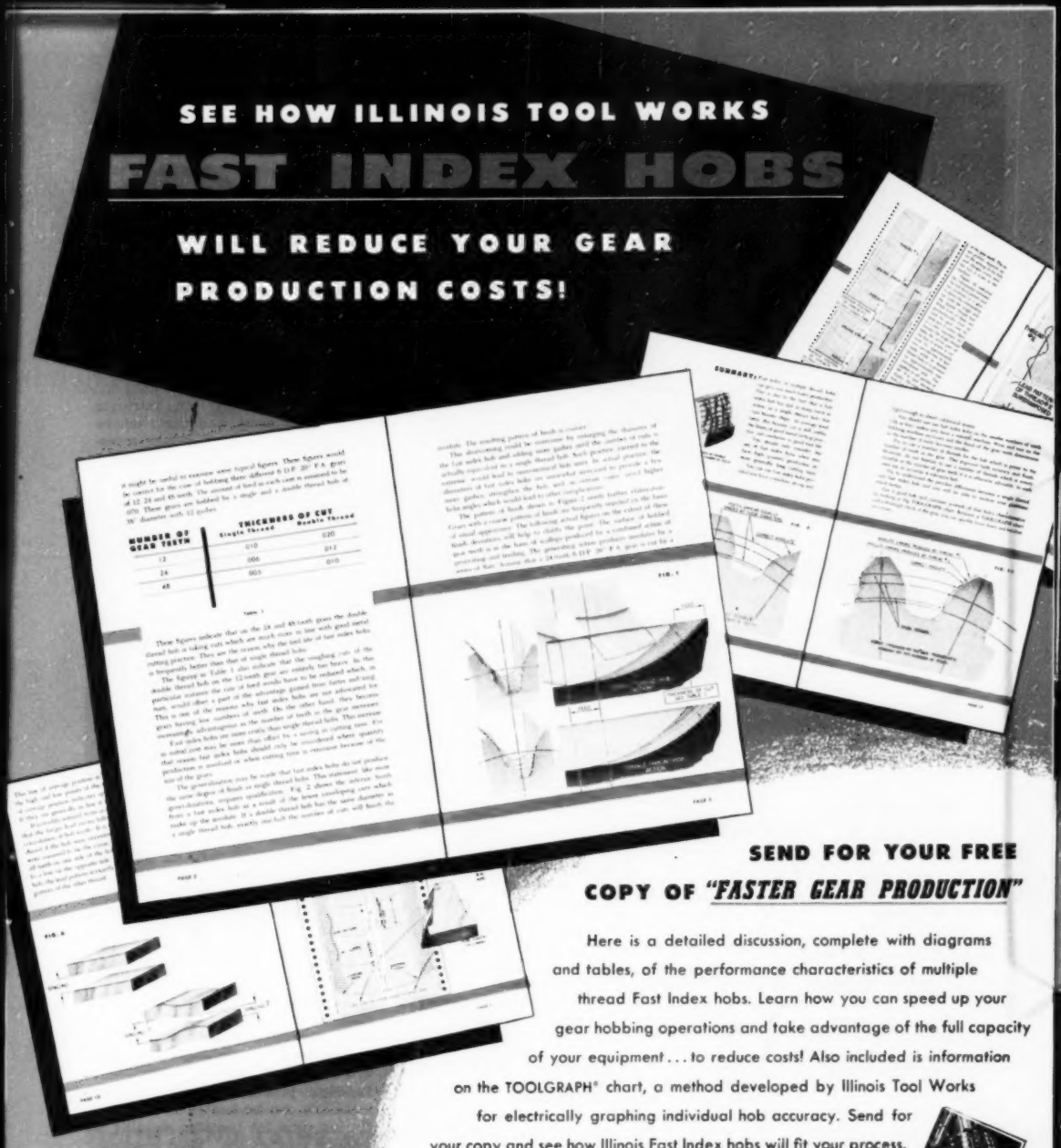
If a machinist is worn out at my age, how is it possible that a man over 75 is elected vice president of our nation? It is not my intention to belittle this man, but merely to bring out the inconsistency of thought.

Many articles of mine have been published in *American Machinist* and in *Wings*—the Army-Navy magazine published during the war. Perhaps

SEE HOW ILLINOIS TOOL WORKS

FAST INDEX HOBS

WILL REDUCE YOUR GEAR PRODUCTION COSTS!



SEND FOR YOUR FREE

COPY OF *"FASTER GEAR PRODUCTION"*

Here is a detailed discussion, complete with diagrams and tables, of the performance characteristics of multiple thread Fast Index hobs. Learn how you can speed up your gear hobbing operations and take advantage of the full capacity of your equipment... to reduce costs! Also included is information on the TOOLGRAPH® chart, a method developed by Illinois Tool Works for electrically graphing individual hob accuracy. Send for your copy and see how Illinois Fast Index hobs will fit your process.

MAIL THIS COUPON TODAY!

ILLINOIS TOOL WORKS

2301 North Keeler Avenue, Chicago 39, Illinois

HEADQUARTERS FOR ENGINEERED CUTTING TOOLS

*Trade Mark Reg. U. S. Pat. Off.

PLEASE SEND MY COPY OF ***"FASTER GEAR PRODUCTION"***

NAME

POSITION

COMPANY

ADDRESS

CITY ZONE STATE

FIGURING TOOL COSTS ON PERFORMANCE ... NOT PRICE, PAYS BIG DIVIDENDS

Productivity—not pennies—is the only way to judge the cost of a tool. No tool deserves a place in your shop unless it can prove . . . on the job . . . that it will enable the machine to operate at peak performance, with minimum downtime.

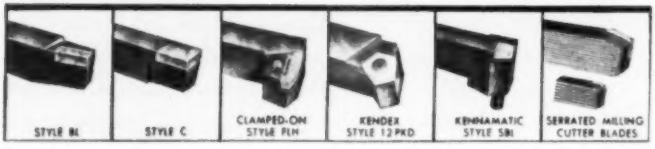
Kennametal cemented carbide tools are made by processes that are exclusive and expensive, but which are worth far more than the cost . . . because they assure a tool material of consistent soundness.

This Kennametal characteristic pays off—in your shop. In many instances, Kennametal tools will pay for themselves in savings effected in grinding, alone. And this does not take into account reduced tooling costs, and improved production rates attained.

We'll send you, on request, reports that show cost reductions of thousands of dollars on many different operations through the use of Kennametal tooling. But—there is a much better way to demonstrate. That's in your shop, on your job. Ask us to do it.

KENNAMETAL Inc., LATROBE, PA.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY



you will publish this letter too. There must be a great many old-timers who feel as I do.

C. M. Huntley
Seattle, Wash.

Low-Pressure Phenolic Molding

E. F. Borro of Durez Plastics & Chemicals, Inc., covered the increased demand for low-pressure-molding plastic materials at the recent SPI meeting. Major points were:

Soft materials have been used for many years, mainly on intricate parts, small parts, and parts where delicate mold details had to be transferred. New low-pressure materials, among them Durez 13527, can be made into such products as record-player cases, vacuum-cleaner housings, telephone bases, television cabinets, and camera parts. Low-pressure materials today are plastics that can be molded into parts like these at 200 psi.

When low-pressure materials are formed in molds originally made for accumulator-operated presses on low-and-high pressure systems, actual forming pressures vary from the ideal 200 psi. However, with such molds, regular curing times are employed, and in some cases curing times can be reduced.

Fast-action presses, properly designed for low-pressure operation, should have slow press-closing devices, which build up back pressure and prevent splashing. Even with slow press action, the final closing should be even slower.

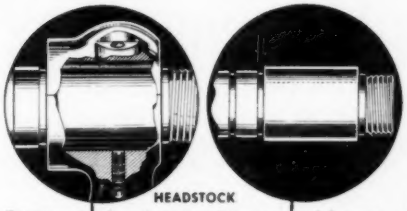
The great advantage of low-pressure materials is the capacity of the press that is required. This makes a difference in investment—often as much as half.

In transfer molding, small diameters and long sprues and runners can be molded easier. High-frequency preheating of conventional materials in a pot transfer mold requires about 12,000-psi pressure, but low-pressure materials can be heated at 4000 psi. Curing time for transfer molding is usually shorter, too. Mold construction is the same except that a pot-clamping safety factor of 15 to 25% is allowed.

Plunger molding is usually done at 8000 psi, so the maximum safe mold area in a 200-ton press is 45 sq in. With low-pressure materials, the pressure can be as low as 1500 psi, so pieces of five times the area can be formed.

Finish on these materials is normally superior to conventional-material finishes.

SOUTH BEND 9" LATHES



HEADSTOCK

Bearings are line bored and bearingized for precision fit. Ample lubrication from oil reservoirs. Spindle is carburized, hardened, and ground; with bearing sufaces super-finished to .000005" rms.

BELT RELEASE

Instant release of belt tension for speed changes. Proper tension of headstock spindle drive belt is easily adjusted.

TAILSTOCK

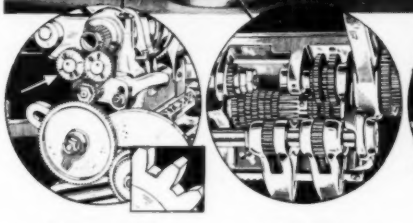
Has set-over for taper turning. Graduated spindle has witness mark for aligning cutter bit. Hardened center self-ejecting.

BED

Three V-ways and one flat-way are hand-scraped entire length for precision alignment of headstock, tailstock, and carriage.

APRON

Has powerful friction clutch and large half-nuts. Safety interlock prevents engaging opposing feeds. All gears machine cut.



REVERSE GEARS

Easily shifted for reversing lead screw rotation and feeds, positive lock. All the gears used in this lathe are machine cut.

GEAR BOX

Screw threads and power feeds selected by shifting two tumblers as indicated on index chart. All gears machine cut steel.

CARRIAGE

V-ways and dovetails hand-scraped. Engine divided micrometer collars on feed screws. Compound Rest base graduated 180 degrees.

Specifications...

South Bend 9" Model A Lathe

SWING	over bed — 9-1/4"
	over cross slide — 5"
BED LENGTHS	3, 3-1/2, 4, and 4-1/2 feet
DISTANCE BETWEEN CENTERS	16" to 34"
SPINDLE SPEEDS (12)	41 to 1270 r.p.m.
POWER FEEDS:	
Longitudinal (48)	.0015" to .0853"
Cross-feed (48)	.0004" to .0252"
THREADS (48 pitches)	4 to 224 per inch
MAXIMUM COLLET CAPACITY	1/2 inch
SPINDLE BORE	3/4 inch
TAILSTOCK TOP SET-OVER	5/8 inch

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419 East Madison Street, South Bend 22, Indiana, U. S. A.

Please send catalog(s) checked:

- ☐ Catalog No. 9 — all models of South Bend 9" Lathes.
- ☐ Catalog No. 100 — all sizes of South Bend Lathes.
- ☐ Catalog No. 400 — South Bend Precision Drill Presses.
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9" x 3' Model A Bench Lathe, illustrated (Cat. No. 644-Y), with 12-speed horizontal drive, motor, and control — less bench . . **$335.45***

Time Payment Terms — $84.45 down, 12 monthly payments of $22.17.

Other models of South Bend 9" Lathes, priced from $192.45* to $796.45*, may also be purchased on time payment terms of 25% down with balance in 12 monthly payments, small finance charge.

*Prices, f.o.b. factory, include 3 phase, 60 cy., 220-V., motor and control.

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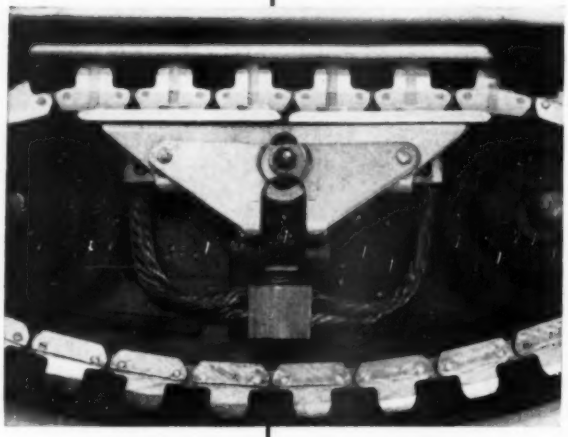
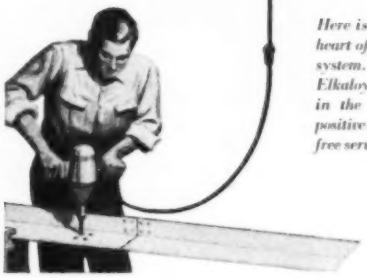
In the BENBOW "Trac Troly" Safety Conductor Systems MALLORY METALS outperformed all others by better *than 10 to 1!*





Here is a phantom blow-up of the heart of the Benbow "Trac Troly" system. Note the way Mallory Elkaloy contacts have been inserted in the collector chain teeth—for positive contact that will give trouble-free service as long as the unit lasts.

—"we are simply elated with the increase in performance we have had with the Mallory contact design!" That's the way Benbow writes after months and months of grueling use.

Their "walking" mobile electric system with chain teeth supplies a *completely safe* method of electrifying portable tools and hoists. But Benbow *did* have a tough problem in making its unique current collector and "trac troly" system as long-lasting and trouble-free as it was different. So, Benbow turned to Mallory for its experience and tough metals that had *high conductivity* plus *longer wear resistance!*

Both Mallory engineers and metals came through with flying colors. By using Mallory 3* Metal shoes and Elkaloy* A contacts on each of the collector chain teeth, Benbow achieved "excellent results on the toughest installations."

This case history is added proof that you can't beat Mallory's resources and skills in the special metals field. Write Mallory today concerning *your* problem. Let the engineers that helped Benbow help you!

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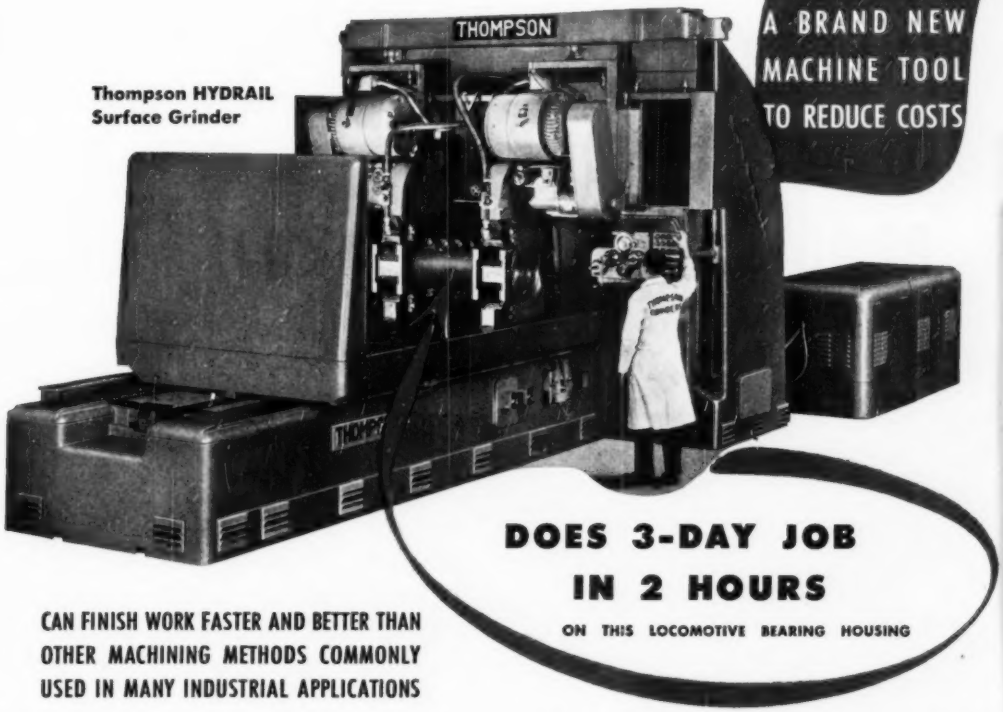
Grinds to tolerance of .0008 in. over area 72" x 120"


THOMPSON
A BRAND NEW MACHINE TOOL TO REDUCE COSTS
Thompson HYDRAIL Surface Grinder
DOES 3-DAY JOB IN 2 HOURS
ON THIS LOCOMOTIVE BEARING HOUSING

CAN FINISH WORK FASTER AND BETTER THAN OTHER MACHINING METHODS COMMONLY USED IN MANY INDUSTRIAL APPLICATIONS

Thompson HYDRAIL Surface Grinders with bridge type construction open new fields for surface grinding. These machines are now available for production and maintenance jobs on large work in aircraft, automotive, railroad and other industries.

For example, the HYDRAIL Machine illustrated, reduces finishing time of massive diesel-locomotive bearing housing wear-strips from three days to a matter of two hours . . . grinding tolerance of .0008 inch over an area 72" wide by 120" long.

In other industrial applications large dies can be sharpened on a Thompson HYDRAIL Machine without stripping down and all die surfaces will be in correct relation.

Thompson HYDRAIL Surface Grinders are made to your specifications with one or two wheel heads. The capacity of the machine illustrated is 72" x 36" x 120". It has two wheel heads so that two operators can grind from separate controls simultaneously.

Table speed is adjustable from 10 to 100 feet per minute. The machine weighs approximately 130,000 pounds. Controls are both automatic push button and manual. Wheel heads may be built horizontally or vertically or both, if two wheel heads are desired. Wheel head cross feed ranges from 1/8 to 6 inches per table reversal. Spindle bearings are silver lined and pressure lubricated. All bearings are totally sealed. This machine provides for the utmost flexibility of operation and simplicity of control. *Write today for other details or information concerning possible application in your production work.*

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

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Address Dept. 10

COMING NOVEMBER 3rd, 1949

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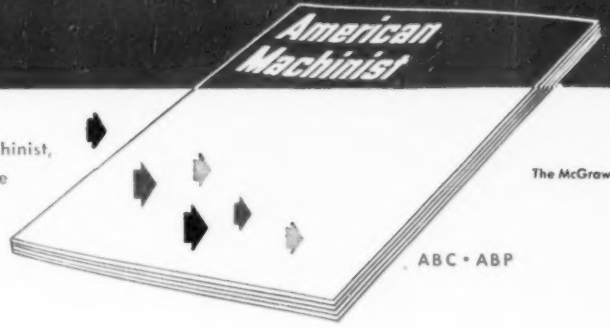

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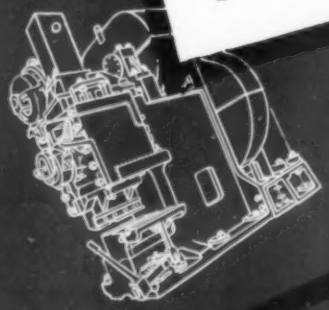

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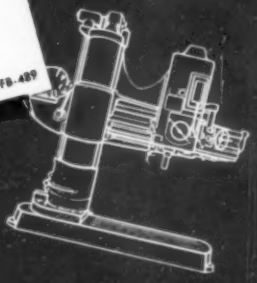

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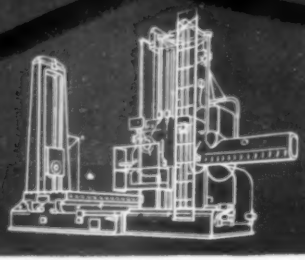

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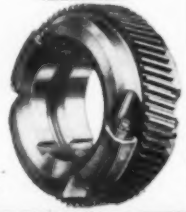

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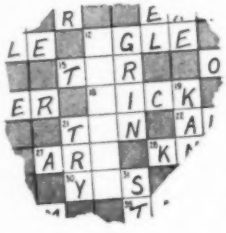

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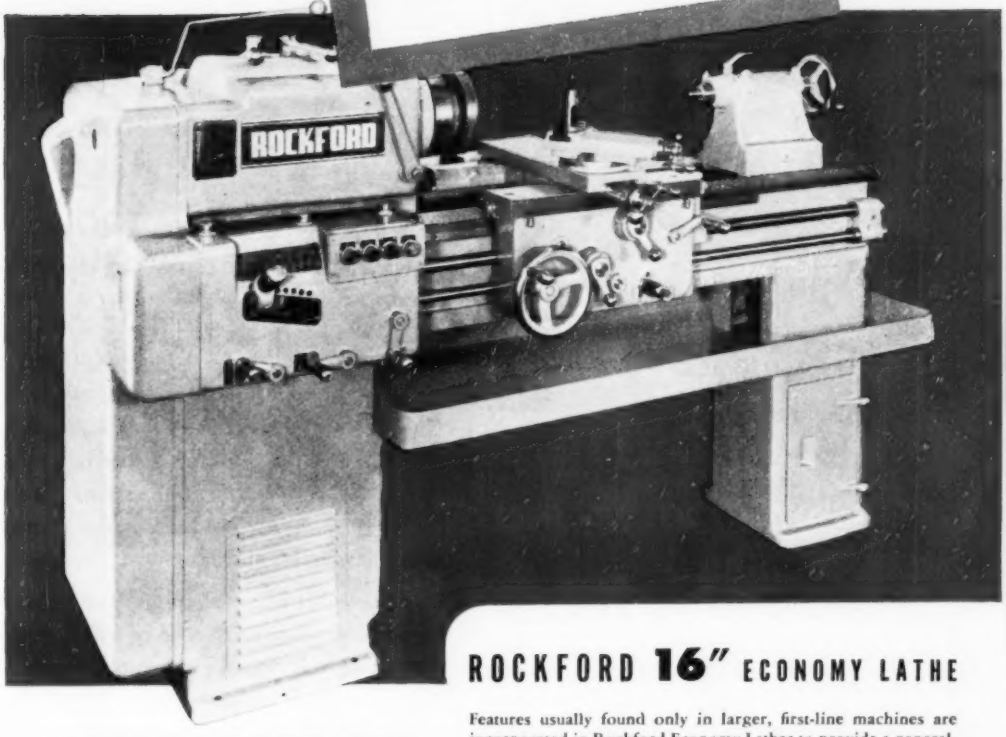

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- ★ SPEEDS FOR CARBIDE MACHINING
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Features usually found only in larger, first-line machines are incorporated in Rockford Economy Lathes to provide a general-purpose tool equal to any job within its 16½" actual swing — high production, maintenance or tool room.

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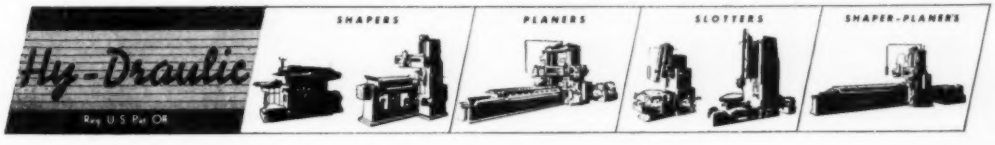

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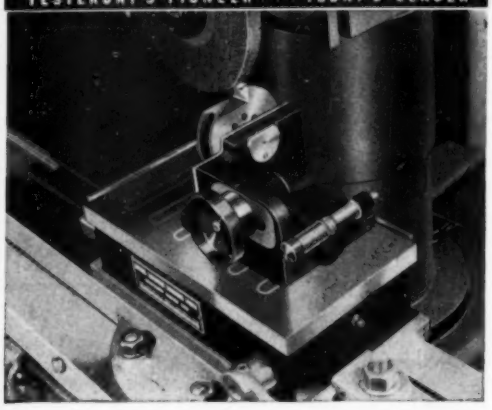

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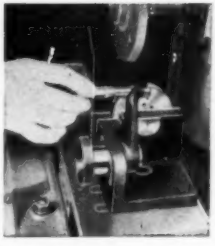
CIRCULAR FORM TOOL SHARPENING and MEASURING FIXTURE . . .



To reduce tool and production costs give circular form tools the treatment they deserve by the use of the Weldon Circular Form Tool Sharpening and Measuring Fixture.

It's a convenient and accurate aid in sharpening and measuring of all sizes of high speed steel or carbide tipped circular form tools. Insures maintaining the original shape of form tool by keeping proper relationship of cutting face to center line of tools.

The micrometer measures the correct distance the cutting face should be below center line of tool. The fixture may be used on any surface grinding machine.

Write for descriptive folder
No. CGM 1-49

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

Delta's line of grinders includes this Delta Toolmaker* Surface Grinder, as well as the Delta Toolmaker Chip-Breaker Grinder, Delta Toolmaker Tool and Cutter Grinder, Delta Carbide Tool Grinder, and Delta Grinder with Twin-Lite* Safety Shields.

DELTA
MILWAUKEE
®

Delta Toolmaker† Surface Grinder

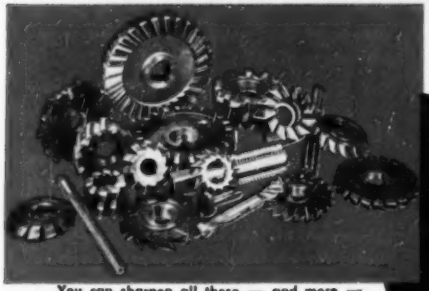
Shown at left working on a lathe bit. Has wide graduations on micrometer, for close settings. Unique wheel adapter saves time and redressing. Many other features. 7" x ½" wheel, 1¼" bore.

With simple attachments, this versatile machine becomes an efficient tool-and-cutter grinder or a chip-breaker grinder.

No. 24-105

$375*

without wheel, motor, or switch.



You can sharpen all these — and more — with Delta grinders.

These DELTA® machines cut grinding costs for toolroom and production work

Delta Grinder with Twin-Lite† Safety Shields — Twin-Lite Safety Shields act as "built-in goggles," flooding your work with light. Fully-machined tool rests. Balanced wheels. Lubricated-for-life ball bearings.

No. 23-405 — Complete with safety shields, lamp bulbs, wheel guards, and wheels. - - - - - - - - - $114

Delta Carbide Tool Grinder— Combined with Delta's standard tool grinder for hogging down the shank steel, this machine gives you a perfect working combination for sharpening tungsten carbide tools.

No. 23-555 — Complete with lamp attachment, water pot, and wheels - - - - - $154

You would expect to pay much more for the all-around high quality you find in these low-cost Delta grinders. Delta's advanced engineering helps make industrial grinding easier, cheaper, and extremely accurate. Plant owners, superintendents, and engineers everywhere can tell you that.

Delta grinders are available in both bench and floor models—with current and speeds to suit any requirement. Simple, easily-adjusted attachments increase the utility of these machines.

Your nearby Delta distributor has these popular grinders on display now. Inspect them there. Ask about buying on easy credit terms.

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Look for the name of your Delta distributor under "Tools" in the classified section of your telephone directory.

Unihead† — A universally-adjustable work head, designed for use in connection with Delta Toolmaker Cutter Grinder. See details in catalog A-48.

Univise†—The first truly universal vise for grinding, drilling, and milling. With coolant attachment, converts Delta Toolmaker Surface Grinder to accurate Chip-Breaker Grinder. See details in Delta catalog A-48.

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M-36

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INSTANT CUT-OFF ASSURED

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Operation of the valve is entirely automatic. No electrical or mechanical motivation is required since it is activated by cylinder pressure.

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Ross makes valves only—hundreds of types and sizes. Take advantage of the experience gained in over a quarter century of concentration on control and application of air power!

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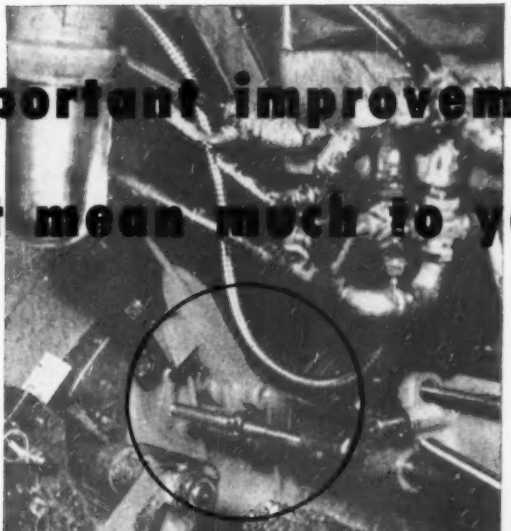
—about Antisep A.P. cutting base!



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than was possible when first introduced —giving you now a cost of only about 6 cents per gallon for cutting fluid dilutions ready to use.

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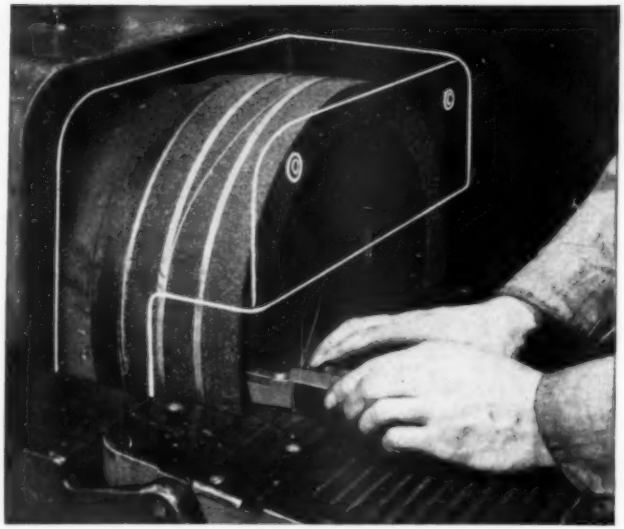

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The Buxite Process is a revolutionary method of coating **each individual grain** of Buxite wheels with a microscopically thin shell of carbon in an isotropic vitrescent form. Each shell permits its grain of abrasive to turn, exposing every cutting surface before it is worn away. Each succeeding layer of grains are contained in their individual carbon shells, assuring constant grinding action during the life of the wheel.

REPRESENTATIVES NOTE: There are a few desirable territories available to well qualified representatives. If you are interested, write us, giving full particulars of your operation and qualifications.

Buxite grinding wheels perform better and actually cut faster with light pressure. This means that carbides and other superhard steels can be ground with less heat being generated . . . which prevents checking and cracking, lengthening the life of the tools.

GRIND CARBIDE TOOLS AT 75% TO 85% LESS COST

Not only do Buxite wheels increase carbide tool life, but they give a cleaner grind and better finish. Buxite wheels do not "load" when grinding sintered tools, eliminating frequent stops for dressing, and the hard-shelled grains makes the life of each Buxite wheel 4 to 6 times that of ordinary wheels.

REDUCE DIAMOND WHEEL CONSUMPTION

The lighter cuts and cooler grinding action of Buxite grinding wheels results in excellent finish on Tungsten Carbide and other types of superhard alloys. Buxite wheels always reduce and frequently eliminate the need for diamond wheel grinding on this type of tool. This saving in diamond wheel consumption and costs is an important reason so many manufacturers and metal working shops have standardized on Buxite wheels for their tough grinding operations.

ADDITIONAL ADVANTAGES OF BUXITE WHEELS

Every feature of Buxite wheels contributes to faster production and lower piece cost on grinding operations involving super-hard tool steels. Faster, cooler cutting action, longer tool life, longer wheel life and reduction or elimination of diamond wheel consumption result in greatly lowered costs. If our representative has not called recently, write direct to us for additional information and money-saving facts.

MANSCO GRINDING WHEEL CO.

2164 EAST 36TH STREET — CLEVELAND 15, OHIO

Exclusive Suppliers of BUXITE *Grinding Wheels*

Substitute 1 Machine for 3 or 4!

RAISE PRODUCTION and LOWER COSTS

BY COMBINING OPERATIONS with the MOTCH & MERRYWEATHER

"DE" (Double End) TRANSFER MACHINE

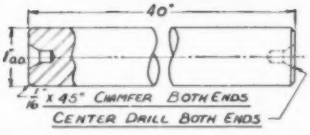
1 SAWS STOCK TO ACCURATE LENGTHS

2 (1) Chamfers both ends. (2) Center drills both ends. (3) Center drills and chamfers both ends. (4) Threads both ends (to a reasonable length). (5) Trepans one or both ends. (6) Turns one or both ends (box tool). (7) Chamfers O.D. and I.D. of tubing. (8) Reams one end or both ends of tubing. (9) Chamfers O.D. and reams both ends of tubing.

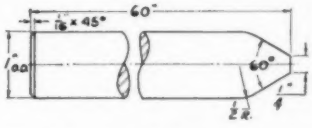
MORE THAN A NEW MACHINE—ACTUALLY A NEW METHOD

• The Motch & Merryweather "DE" (double end) Transfer Machine has no equivalent. Standard bar stock is automatically fed, cut off with a square *milled finish* to accurate lengths of ±.004"; then automatically transferred to equalizing, self-centering jaws for accurate double-end machining. You save at least one operator; save several handlings; save overhead and floor space; save tooling. Husky construction makes for trouble-free service and long, profitable life.

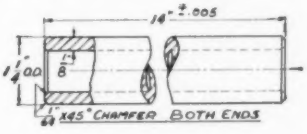
Illustrated below are six typical "transfer" jobs.



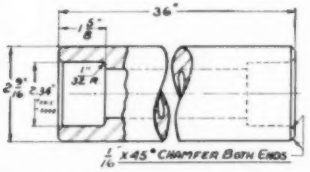
Operation: Cut off, chamfer and center drill both ends.
Material: SAE 1040 ground shafting.
Production: 240 pcs/hr.



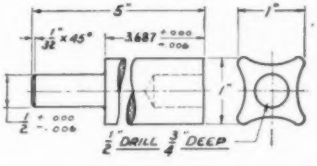
Operation: Cut off, chamfer one end, point opposite end.
Material: D SAE 1141 C. R.
Production: 163 pcs/hr.



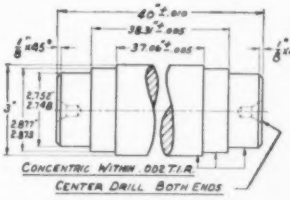
Operation: Cut off and chamfer both ends.
Material: 1020 seamless tubing.
Production: 342 pcs/hr.



Operation: Cut off, bore and chamfer inside and outside, both ends.
Material: SAE 1020 tubing.
Production: 180 pcs/hr.



Operation: Cut off, turn one end, drill opposite end.
Material: Extruded brass.
Production: 200 pcs/hr.



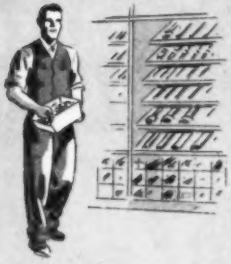
Operation: Cut off, box mill, turn and center drill both ends.
Material: SAE 1020.
Production: 140 pcs/hr.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

Here's what they say about P-K®

SIZE-MARKED Socket Head Cap Screws



TOOL CRIB BOSSES say sorting is made easier, speeded up . . . just a quick glance at the head of any P-K Cap Screw reveals its size.

ASSEMBLY LINE OPERATORS report valuable time saved because sizes are always issued correctly . . . no time out to find out — job moves faster.

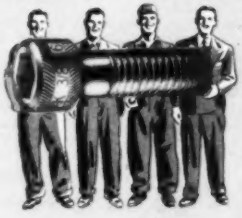
NEW HELP agree sizes can be learned faster . . . also, the Size-Mark protects them from errors.

SALES MANAGERS, TOO, recognize the Size-Mark as an added sales-feature . . . a definite aid to customers' service men in reassembly.

Plus . . . GEAR GRIP*. . . it simplifies work!

Gear Grip on Size-Marked Socket Head Cap Screws is a further aid to fast work . . . prevents slipping even when fingers are oily.

ONLY PARKER-KALON OFFERS BOTH Size-Mark and Gear Grip in Socket Head Cap Screws. See how they save time and trouble all along the line.



SEND FOR SAMPLES. Discover for yourself why P-K Socket Screws can put your product out front, assembly-wise and sales-wise. Parker-Kalon Corporation, 200 Varick Street, New York 14, New York.

P-K Socket Screws are available for prompt delivery in every industrial area.

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for 50 Years

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GEAR PRODUCTION HIGHLIGHTS

No. 104

Cutting-Shaving-Checking-Lapping

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

Job-Lot Gear Finishing in Mass Production Quantities

Where does "job lot" production of gears leave off and "mass production" begin? Canadian Acme Screw and Gear, Limited, Toronto, Ontario, has an answer: It doesn't. You can have both—at the same time. Its plant at Toronto provides the proof. Here, by a process of ingenious tooling and gear designing:

A. 25 gears for several different types of truck and agricultural equipment transmissions are turned out with just two cutters.

B. These 25, plus transmission gears—both spur and helical, single or cluster—for three popular light duty trucks and two passenger cars can be produced on the same machine with a total of just 12 quickly interchangeable cutters.

C. Each of these gears can be finished in a machine cycle time of only 20 seconds per gear.

Basic approach to achieving these results at Canadian Acme was two-fold and consisted of:

1. Designing gears so that a maximum number of types can be finished with the minimum number of cutters.
2. Selecting a finishing machine to give minimum cycle time and minimum time for tool changes.

A total of only 12 different cutters are required to shave 32 of the 39 gears shown in Fig. 1 which are shaved on the Michigan 870 (Fig. 2). The other seven are not shaved. Canadian Acme engineers have further standardized all the gears shown in Figs. 3 and 4 so that the two cutters shown will shave a majority of the total gears in the group. Gears at the left of Fig. 4 are all 8/10 pitch and 20 degree pressure angle.

Three types of rotary gear shavers have been and are in use at Canadian Acme. The latest machine (Fig. 2) is a Michigan Tool Company series 870 three-way machine ("underpass" shaving, "transverse" shaving, or "traverpass" shaving). Its key position in the production line is due to three factors:

1. Its ease of set-up permits rapid changeover from one gear to another (switches are made 3 or 4 times a day to take care of output of different gear cutting lines).
2. Longer tool life.
3. In some cases cycle time is shorter (20 seconds vs. 40 seconds on machine No. 2). In no case is cycle time longer.

For further information on Michigan series 870 gear shavers, write Michigan Tool Company, 7171 E. McNichols Road, Detroit 12, Michigan.

Fig. 1

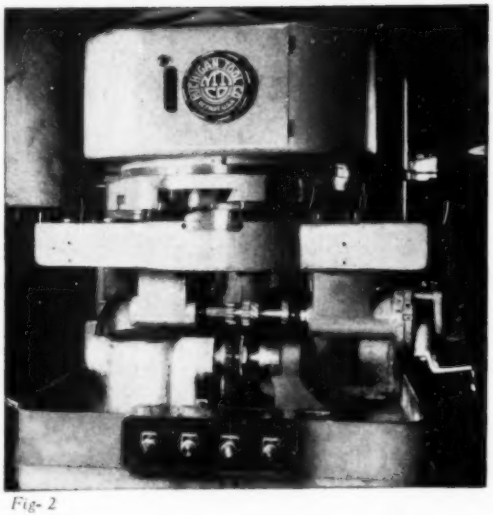


Fig. 2

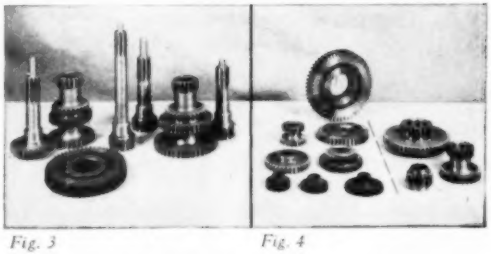


Fig. 3 *Fig. 4*

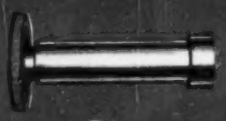
Performance data on the Michigan No. 870 is:

Output.....110-120 gears per hour
Stock removed (over pins).....006-.008″
Gear material.....SAE 4620

Typical Approximate Tool Life

17 tooth, 1½″ face gear..... 5000/grind
43 tooth, ⅜″ face gear.....15000/grind

WHICH ONE? *NAME YOUR SPINDLE*



P-1

3" dia. wheel; housing dia. 3⅛", over-all length 15⅜", max. speed 6000 RPM.

P-32T

Direct Motorized Cartridge Type Grinder Spindle.

P-2500

from ¼ to 20 HP. Ask for Catalog 58.

INTERNAL

Internal Grinding Spindle for every requirement. Ask for new Catalog 57.

P-274

New belt driven Spindle for No. 2 Cincinnati Cutter Grinder.

P-666

Heavy Duty Wheel Head Spindle; over-all length 25⅞"; center height 3"; foot type housing 18¾" long x 8⅞" wide; max. speed 4000 RPM.

P-693

High cycle 16,600 RPM, totally enclosed fan cooled 1 HP motorized spindle, over-all length 18¾", barrel dia. 3".

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TRADE MARK REG. U.S. PAT. OFF.

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P-5793

3, 5 or 10 HP, heavy duty deep hole grinding Spindle; 1800 or 3600 RPM; barrel dia. and length to specifications.

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Standard Specifications

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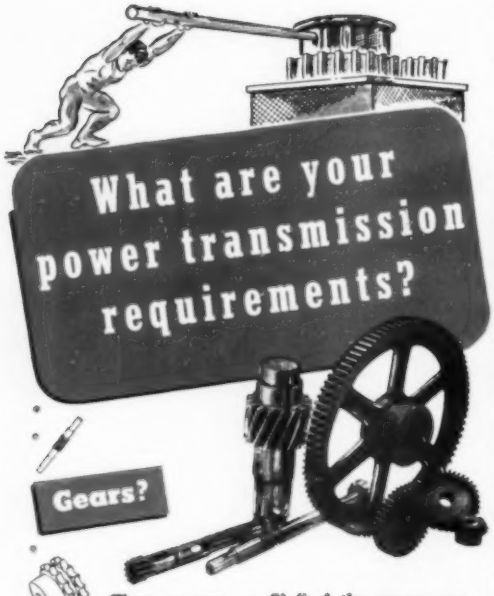
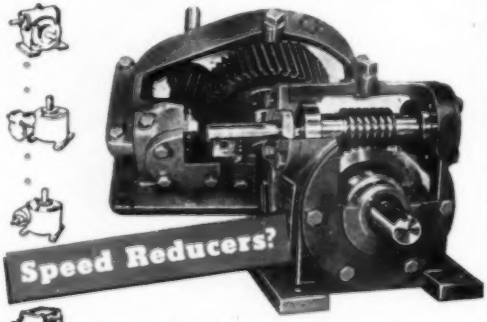


Chances are you'll find the gear you want available from Grant's mammoth stock. If not, complete facilities are available to cut all types. Deliveries made on your schedule. Write today for free catalog describing complete line.



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Special requirements? . . . unusual and difficult jobs are a Grant specialty . . . for an estimate write outlining your problem.

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Final finish on pianos mysteriously going "sour." Production halted. Lab needed X-ray diffraction camera to identify impurity. At 9 A.M., 10-lb. camera was Air Expressed from 1100 miles away, delivered 4 P.M. *same day*. Cost, only $3.58. Company uses Air Express as routine method to get supplies fast, keep inventory low.

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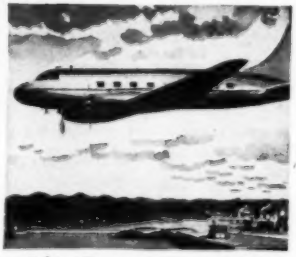

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4 reels of VEELOS replace 316 sizes of endless v-belts

• Why jam your stockroom with costly inventories of hundreds of sizes of endless v-belts when 4 reels of VEELOS will handle every v-belt job in the O, A, B and C widths? If you use only two widths of v-belts, two reels of VEELOS will be all you need.

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MANHEIM, PA.

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Courtesy Hyscore Arms Co., Brooklyn, N.Y.

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Aiming for an inventory reduction . . . lower production costs . . . or a sales edge on competition? Try sighting along the tubing idea in this target pistol.

This airgun is accurate within a $\frac{3}{4}$" bulls-eye on a 20' test range. It is powered by a hardened piston which, in only a 2" stroke, develops enough energy to slam a .22 cal. pellet through a $\frac{3}{8}$" pine board.

Note the ingenious design . . . how the entire gun barrel, from piston chamber to gunsight, is cold-swaged from a single piece of seamless steel tubing—a considerable saving over composite construction. The barrel tubing is supplied by Frasse with a special I. D. cylinder finish, to close tolerances—and provides a leakless air-seal for the piston—*without the expense of further machining.* Completion of the barrel requires 15 separate fabricating operations, from swaging and broaching through milling and threading—an exacting application made possible only with quality tubing and engineering teamwork.

Frasse, a leading distributor of steel tubing, stocks a wide range of immediately available carbon, alloy and stainless analyses to work from. But equally available, and equally useful, are Frasse engineering facilities to help you use tubing to your economical advantage. *Call Peter A. FRASSE and Co., Inc., 17 Grand St., New York 13, N. Y. (Walker 5-2200) • 3911 Wissahickon Ave., Philadelphia 29, Pa. (Baldwin 9-9900) • 50 Exchange St., Buffalo 3, N. Y. (Washington 2000) • Jersey City • Syracuse • Hartford • Rochester • Baltimore*

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FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 RADIAL DRILLING MACHINES—*The Cincinnati Gilbert Machine Tool Co., Cincinnati 25, Ohio.* 8-page bulletin complete with data, tables and cut-away drawings, describes the company's 3- and 11-in. column drilling machines. Spindle speeds for the different machines range from 34- to 1800 rpm.

2 INCLINABLE PRESSES—*J. W. Ehrr Co., 1925 Hastings St., Toledo 7, Ohio.* 24-page catalog No. 2-C covers 15 Ehrr open-back inclinable presses ranging in capacity from 10 to 200 tons. Complete dimensions and special features of all models are listed.

3 HOBBING MACHINES — *Barber-Colman Co., Rockford, Ill.* 24-page bulletin gives descriptions and complete specifications for all Barber-Colman hobbing and hob-sharpening machines. Pictures and uses of the company's hobs, milling cutters, and reamers are included.

4 HONING MACHINES—*C. Allen Fulmer Co., 1211 First National Bank Bldg., Cincinnati 2, Ohio.* 12-page bulletin No. 10 contains a brief description of the honing operation and of Fulmer honing tools and machines. Machines can remove stock from internal cylinders ranging from ⅜ to 30 in. dia. satisfying ± 0.0001 in. tolerance on size, straightness and roundness.

5 SURFACE GRINDERS—*Mattison Machine Works, Rockford, Ill.* 8-page bulletin No. 114-2RH describes the Mattison No. 24 Rotary Surface Grinder. Standard equipment for this machine includes 36-in. magnetic chuck, 30-hp wheel motor and 18-in. cylinder-type grinding wheel. Work up to 14 in. high and occupying a space 30 in. in diameter can be handled by the machine.

6 SHEET-METAL MACHINES AND TOOLS—*Niagara Machine & Tool Works, Buffalo 11, N. Y.* 16-page bulletin No. 12 lists the Niagara line of presses, shears, machines, and tools for plate and sheet-metal work. Included in this pocket-size pamphlet is a table of circles, circumferences, and areas ranging from 1/64- to 126-in. dia.

7 CYLINDRICAL GRINDERS—*Landis Tool Co., Waynesboro, Pa.* 4-page bulletin S-49, describes the new Grindmaster general-purpose cylindrical grinder. Maximum distance between work centers for this machine is 25 in. Minimum diameter for internal work is 9/16 in.

8 FINISHING EQUIPMENT — *Hammond Machinery Builders, Inc., 1699 Douglas Ave., Kalamazoo, Mich.* 14-page catalog No. 60 covers polishing, buffing, grinding, and deburring equipment. Applications included. The line also includes abrasive belts, cleaning, and sharpening equipment.

9 TAPPING MACHINE—*Sitco Tool Co., Inc., 594 Johnson Ave., Brooklyn 6, N.Y.* 2-page bulletin No. 72 describes this company's new No. 72 tapping machine. The unit is adaptable to either single or multiple tapping operations.

10 TURNING MACHINE—*The Monarch Machine Tool Co., Sidney, Ohio.* 32-page pamphlet gives complete description and specifications for the company's Mona-Matic "Air-gage Tracer" controlled, automatic-cycle production machine for single-point metal turning. Included in the pamphlet are feed charts devised to simplify calculations of speed and feed on Monarch machines.

11 FEED UNIT—*Avey Drilling Machine Co., Cincinnati 1, Ohio.* 4-page bulletin shows typical applications of the Avey-Dreadle feed unit which provides automatic withdrawal for chip removal.

TOOLS AND ACCESSORIES

12 TOOL HOLDERS—*Weaver Co., 1210 Westwood Hughes Blvd., Ferndale (Detroit 20), Mich.* 8-page bulletin covers the Weaver line of "quick-cut" tool holders. The line includes holders for round, square, and triangular carbide tips.

13 VISES AND ACCESSORIES—*Mateo Tool Co., 1830 W. Lake St., Chicago 12, Ill.* Two, 2-page and four, 1-page pamphlets describe wheel dressers, multi-angle precision vise, drill jig, universal adjustable angle plate, collet heads, and radius-angle wheel dresser put out by this company.

14 SCALES—*The Yale and Towne Mfg. Co., Philadelphia, Pa.* 12-page bulletin gives typical information and description of the Yale Weight Printer, a flunkydeck equipment scale which automatically records weight of items being weighed. Various models range in capacity from 100 lb by 1/10-lb graduation to 50,000 lb by 50-lb graduations.

15 PRECISION GAGE — *The Sheffield Corp., Dayton 1, Ohio.* 24-page bulletin describes various models of the Sheffield column-type Precisionaire gage and demonstrates its varied uses. Available in both single and multiple units these air gages can be adapted to measure either inside or outside diameters.

16 GRINDING-WHEEL DRESSERS—*Desmond-Stephan Mfg. Co., Urbana, Ohio.* 1-page cardboard dresser guide describes dressers to be used for proper dressing and truing of different types of grinding wheels. A number of dressers are included.

17 GEAR CHECKER—*Eastman Kodak Co., Industrial Optical Div., 343 State St., Rochester 4, N.Y.* 12-page booklet covers the company's Conju-Gage line of gear-checking instruments. Complete specifications are given for Conju-Gages for checking spur and helical gears up to 8¼-in. pitch dia. and for Kodak backlash gage for gears of ½-in. pitch dia. and up.

18 LATHE CHUCKS—*Jacobs Mfg. Co., Hartford 1, Conn.* 8-page bulletin No. 49-LC explains the uses and operation of the Jacobs handled-nose lathe chuck which can handle any bar between 1/16 and 1¼ in. Also described is the rubber flex variable size collet which can hold bars varying in diameter over a ½ in. range.

19 CARBIDE DRILL—*Ace Drill Corp., Detroit 16, Mich.* 8-page catalog covers all lines of Ace cemented-carbide drills. Booklet includes sizes, lengths, and price ranges for eight different types of drills.

20 POWER FEED—*The Fellows Co., Akron, Ohio.* 16-page bulletin No. DF-105R gives descriptions and uses of the company's "Controlled-Air-Power" machine-tool power feeds. Units are available for drilling, tapping, milling, reaming, threading, and box-tooling operations.

21 PRECISION INSTRUMENTS — *Federal Products Corp., 1144 Eddy St., Providence 1, R.I.* 64-page catalog No. 49 includes descriptions and specifications of the company's precision instruments for measuring and comparing linear dimensions. Dial indicators, grinding gages, test sets, electronic gages, master setting plugs and rings, quantity control, recording gages and special gages are included in the booklet.

WELDING AND HEAT-TREATING

22 PRESSURE REGULATORS — *Air Reduction, 60 E. 42nd St., New York, N.Y.* 32-page catalog includes information on this company's regulators for welding, cutting, special flame processes, and for maintaining gaseous pressures in electrical equipment. The catalog illustrates 26 regulators.

Example

Name John Roderick — fill in below number of ONE catalog wanted

Title Supt.

Company M.C. Devl. Mfg. Co.

Co. Address 691 North St. — (32)

Brooklyn, T. N.Y.

AMERICAN MACHINIST, New York

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1. If you are requesting four pieces or less, please use only the bottom card.
2. Be sure to fill one space for each booklet.
3. When you have filled out one card, detach stamp and mail.

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220 West 42nd Street
New York 18, N.Y.

and describes over 100. Three pages are devoted to flow and pressure charts.

23 THERMOCOUPLES — *Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill.* 48-page bulletin WIC-4 is a data book containing descriptions, prices and recommendations for thermocouples, heat-spot, lead wire, thermocouple wire, hooks, connector plugs and socket assemblies, insulators, and protecting tubes.

24 FURNACES—*Burrell Technical Supply Co., 1942 Fifth Ave., Pittsburgh 19, Pa.* 4-page bulletin No. 315 gives descriptions including complete measurements of the five models of the dual range Burrell unit package box and muffle furnace. Bulletin No. 315 covers the Model LGM Burrell high-temperature electric furnace.

PLANT SERVICE EQUIPMENT

25 CHROME PLATING—*The Cro-Plate Co. Inc., 3343 Main St., Hartford 5, Conn.* 4-page bulletin outlines the precision chromium plating operation developed by this company. Standard cutting tools, new or worn gages, and a variety of other items are plated by this process. Work ranging in dimensions from 1/8 in. to 0.020 in. can be handled.

26 AIR HEATERS—*Curtiss Combustion Co., Toledo, Ohio.* 4-page pamphlet, SC-1141, tells how surface direct gas-fired air heaters operate. Heating times and specifications for numerous operations are listed, as well as tables on properties of heated air.

27 LIFT TRUCKS — *Barrett-Cravens Co., 4669 S. Western Blvd., Chicago, Ill.* 28-page bulletin—4883, presents the improved line of Barrett Lift Trucks. Machine drawings complete with all dimensions are given for each model. Handlift trucks vary in capacity from 1,000 to 15,000 lb.

28 TRANSMISSION BELTING—*U. S. Rubber Co., Rockefeller Center, New York 20, N.Y.* 28-page catalog gives detailed design, engineering, and performance data on this company's line of transmission belts. Tables on belt speeds, arc of contact, friction, horsepower correction, and service factors are included in the material.

29 STEEL CHAINS—*S. G. Taylor Chain Co., Hammond, Ind.* 12-page bulletin contains complete specifications on sizes 35 to 140-in. dia. chains. Working load limits, definitions and cautions, and recommended uses for chain service are given.

30 LEVELING JACKS—*Enterprise Machine Parts Corp., 2731 Jerome at McNichols Road, Detroit 12, Mich.* 4-page brochure illustrates and lists dimensions of the newest Empco Jack. Prices and discounts for different sizes are given.

31 HIGH VACUUM PUMPS—*F. J. Stokes Machine Co., 5900 Tabor Road, Philadelphia 20, Pa.* 30-page catalog No. 700 is a data book containing descriptions, specifications and applications of a complete line of Stokes vacuum pumps. Useful charts, graphs and tables for those in vacuum work are included.

32 SEPARATORS AND METAL DETECTORS—*Eriez Mfg. Co., Erie, Pa.* 12-page pamphlet gives engineering drawings and description of company's line of magnetic separators, drums, pipe-line traps, yard sweepers, and electronic metal detectors. Capacities, weights, and dimensions are included.

33 CHAIN COUPLINGS—*Morse Chain Co., 7601 Central, Detroit 9, Mich.* 16-page catalog C-45-49 covers company's roller chain stock couplings, silent chain stock couplings, heavy-duty made-to-order silent chain couplings, and steel and plastic covers for the two stock couplings. Complete information on dimensions, horsepower ratings, stock and maximum bores is given.

34 CASTERS—*Randolf-Standard Co. Inc., Grand Rapids, Mich.* 12-page catalog contains descriptions and illustrations of the Rapistan line of flame-hardened and steel-forged casters and wheels. The pamphlet also lists metal, plastic, and rubber wheels, rubber and oilite-type bearings, and casters ranging from 250 to 2500 lb. capacity.

35 COMPRESSORS — *Worthington Pump & Machinery Corp., Harrison, N.J.* 16-page bulletin H-650-RSS describes the company's compressors and dry vacuum pumps. Compressors listed range in capacity from 40 to 250 psi. Engineering data is included in the booklet.

36 BURNISHING BARRELS—*Hanson-Van Winkle-Munning Co., Matawan, N.J.* Bulletin BB-104 covers the latest developments in these barrels, giving a general description, including engineering and construction data, operating advantages and specifications of the units described.

PARTS AND MATERIALS

37 WIRE NUTS—*Gries Reproducer Corp., 700 E. 133rd St., New York 54, N.Y.* 4-page bulletin offers ready reference for manufacturers whose products call for wingnuts. Junior and senior types with dimensions and sizes are listed. One page is devoted to other GRC products and services.

38 RETAINING RINGS—*Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.* 9-page mimeographed booklet EDR-1001 deals with the use of Waldes Truarc Beveled Retaining Rings as a means of eliminating end-play resulting from accumulated tolerances. This booklet is liberally interspersed with sketches and cross-section drawings.

39 STAINLESS STEELS — *The Babcock & Wilcox Tube Co., Beaver Falls, Pa.* Card TDC-122 is a convenient reference to stainless Croloy Steels for tubing, giving standard type-numbers by which grades are identified, and the chemical composition limits and ranges.

40 ELECTRIC MOTORS—*Electric Machinery Mfg. Co., Minneapolis 13, Minn.* 32-page booklet covers basic theory, operation characteristics and applications, and control of large induction motors. Photographs, cut-away drawings, and performance charts are included.

41 METAL FRAMING—*Unistrut Products Co., 1813 W. Washington Blvd., Chicago 7, Ill.* 24-page illustrated catalog No. 160 gives data and detailed information on how to frame, hang, support, and mount equipment of all kinds, the Unistrut way. This framing is designed for the electrical, plumbing, heating, ventilating, air conditioning, and mechanical piping fields.

42 AIR-CONTROL EQUIPMENT—*Lehigh Foundries, Inc., Easton, Pa.* 4-page brochure describes and gives all dimensions of 27 different air valves put out by this company.

43 STEEL—*The United States Steel Corp., 429 Fourth Ave., Pittsburgh 19, Pa.* 100-page book entitled "Steel Making in America" describes in simple language the manufacture of steel in the United States.

44 SHIMS, LOCKNUTS, STAMPINGS —*Lamneated Shim Co. Inc., 71 Union St., Glenbrook, Conn.* 8-page "Data File" includes specifications, design factors, applications, and informative material on the shims, locknuts, and stampings produced by this company. The brochure is intended to be helpful to design, production, and purchasing personnel.

45 HEAT-TREATMENT—*Armco Stainless Steel Corp., Middletown, Ohio.* 36-page booklet presents comprehensive and up-to-date information on heat-treating and pickling methods for stainless steels. Recommended procedures based on practical experience are given in detail. Practices and equipment for heat-treating stainless steel, recommended heat-treatments for chromium nickel, ferritic chromium, and martensite chromium types of stainless steel, surface hardening, pickling methods, and heat-treating problems and remedies are all discussed.

46 COLD DRAWING—*Rathbone Corp., Palmer, Mass.* 16-page pamphlet describes the Rathbone Cold Drawing Process. Included are examples of parts produced by this process.

47 FASTENERS—*The American Institute of Bolt, Nut, and Rivet Manufacturers, 1358 Hanna Bldg., Cleveland 15, Ohio.* 12-page booklet gives descriptions, principles of operation, and manufacturers of 26 different locknuts. The last two pages are devoted to a detailed description of the new Security elliptical-collared locknut.

48 BEARINGS—*The Gwilliam Co., 369 Furman St., Brooklyn 2, N.Y.* 16-page Catalog No. 25 includes descriptions of this company's line of roller thrust bearings, ball thrust bearings, step bearings, journal roller bearings and special bearings. Illustrations, dimensions, and section drawings are included.

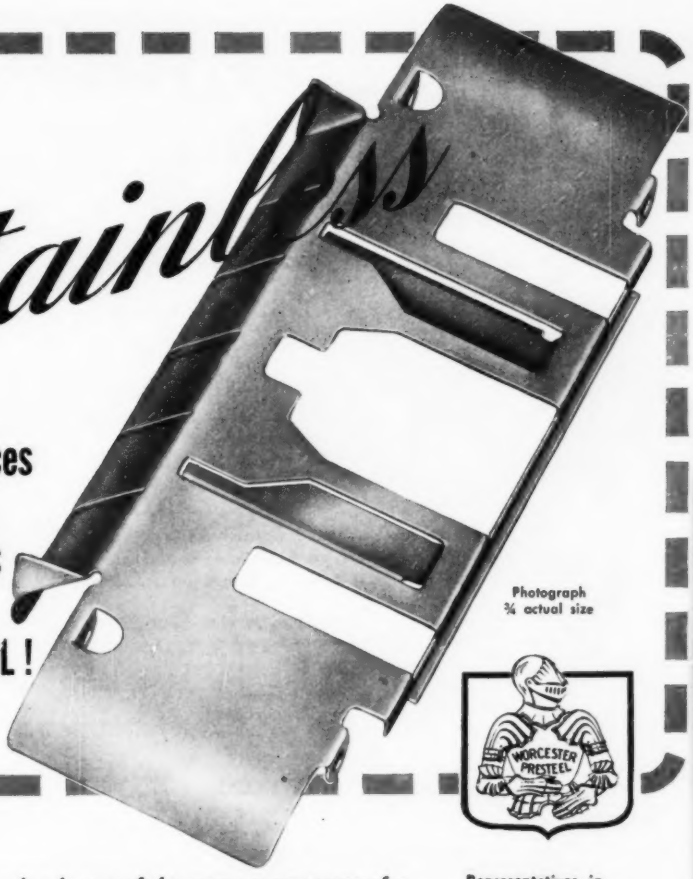
MISCELLANEOUS

49 CONTRACT PLANT—*The Stearns-Roger Mfg. Co., Denver 2, Colo.* 12-page brochure is pictorial record of one of the largest contract manufacturing plants in the West. The plant is equipped to handle large assembly line operations as well as single-unit job operations.

50 CONTRACT METAL-WORKING FACILITIES — *Giro Machine & Stamping Co., 2915 Ford St., Oakland 1, Calif.* 12-page booklet, for manufacturers using metal parts, describes the scope of contract services available from this firm, equipment and methods used, and examples of Giro's work.

Stainless

. . . Presteel produces intricate parts from many metals including STAINLESS STEEL!



Photograph ¾ actual size

This stainless steel stamping is one of the many components of a modern time recording device. To allow uninterrupted production line assembly and accurate recording by the machine, several vital dimensions of this part must be held to close tolerances. Not only must the individual holes and slots, the lanced and formed fingers be held to specifications, but their relationship one to another must be precisely maintained.

More and more stampings are being made from stainless steel. It has many advantages including improved physical properties and resistance to corrosion.

Based on years of metal working experience and know-how, Presteel has developed new and special techniques demanded by the characteristics of this comparatively new material. Let us put this knowledge to work for you!

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BUFFALO
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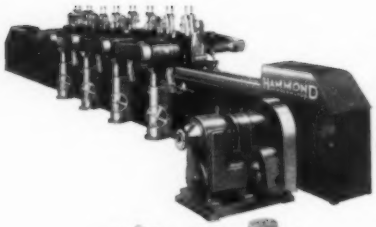
ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

WORCESTER PRESSED STEEL CO.

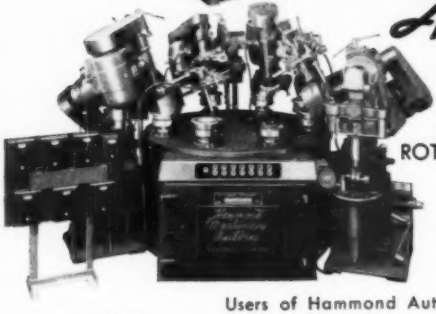
809 BARBER AVENUE
WORCESTER 6, MASS.



FASTER FINISHING

WITH

Hammond



STRAIT-LINE AUTOMATICS

ROTARY AUTOMATICS

JUNIOR AUTOMATICS

There are ten new Junior Automatics in the Hammond Line, to be used with polishing or buffing wheels or with abrasive belts. Model E2PF shown.

Users of Hammond Automatics report 2000 pieces or more per hour, more uniform, better finishing, less operator fatigue and specially, lower costs.

Send one finished and several rough samples for complete engineering and production report at no cost or obligation.

Let us show you what a Hammond Automatic can do on your own work to speed-up production and reduce your finishing costs.

"HAMMOND OF KALAMAZOO
Good Machinery Since '82"

Hammond Machinery Builders INC.

1618 DOUGLAS AVENUE ★ KALAMAZOO, MICHIGAN, U. S. A.

LET ENCO'S VERSATILITY CUT YOUR COSTS

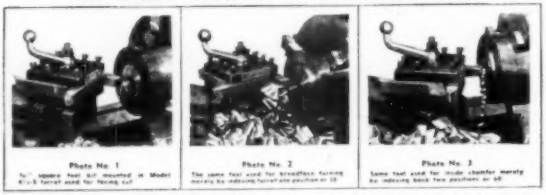


Photo No. 1

Photo No. 2

Photo No. 3

The above photos illustrate the flexibility of 12 position indexing whereby each tool may be used in three different working positions.

SPECIFICATIONS OF A FEW OF MANY ENCO TURRETS

Model No.	HD-2	6-S	4½-R	4½-S	3½-R	3½-S
Suggested Lathe Size	16" to 24"	14" to 20"	15" to 19"	13" to 16"	12" to 15"	10" to 13"
Tool Block Size	6½" sq.	6" sq.	4½" sq.	4½" sq.	3½" sq.	3½" sq.
Solid Tool Capacity	1½"	1¼"	1"	¾"	⅝"	½"
Price	$138.50	103.50	66.50	53.50	46.00	36.75

WRITE FOR CATALOGUE NO. 48 WHICH SHOWS TYPICAL APPLICATION PHOTOS OF MANY OF ENCO'S 35 MODELS ON ACTUAL JOBS.

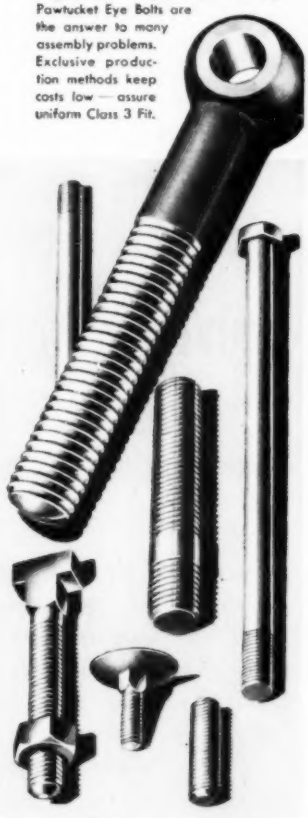
Also Mfrs. of Enco Hexturret Bed Turrets and Tailstock Turrets for 9" to 18" Lathes.

ENCO MANUFACTURING COMPANY Dept. 399, 4524 Fullerton Ave., Chicago 39, Ill.

Looking for specialties

EYE BOLTS

Accurately made in sizes ¼" and larger, or to your specifications, Pawtucket Eye Bolts are the answer to many assembly problems. Exclusive production methods keep costs low — assure uniform Class 3 Fit.



BETTER BOLTS SINCE 1882

Use Headed and Threaded Fasteners for Economy and Reliability

PAWTUCKET

"THE BOLT MAN"

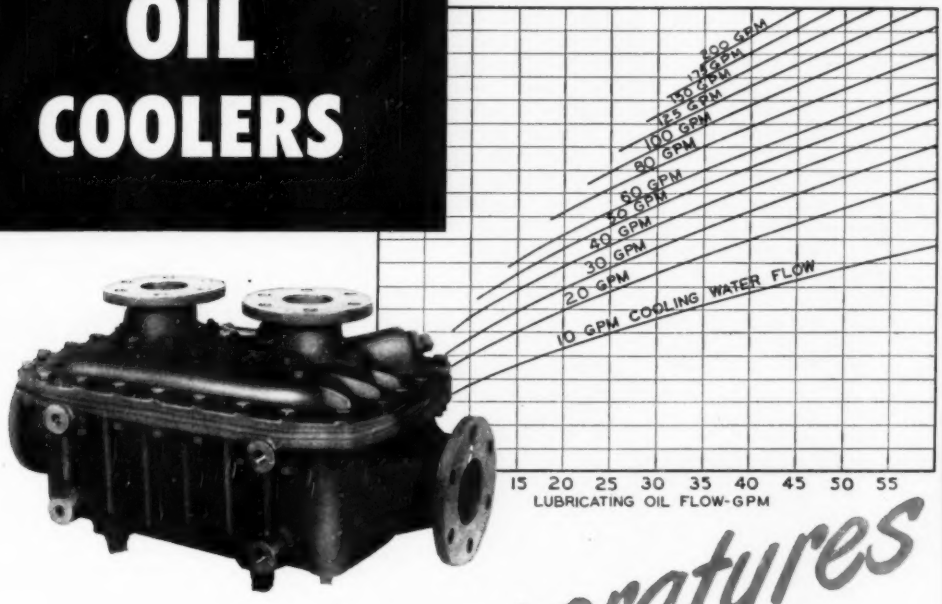
MANUFACTURING COMPANY

327 Pine Street · Pawtucket, R. I.

THE PLACE TO SOLVE YOUR BOLT PROBLEMS

T.M. REG.

HARRISON OIL COOLERS



Control Temperatures TO DO 3 JOBS FOR YOU

1. **Increase Machine Productivity**
2. **Reduce Machine Maintenance**
3. **Extend Machine Life**

HARRISON

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, N. Y.

When good eye protection . . . is no good at all!

This is a common sight in many plants—a condition that contributes to top-heavy accident rates, compensation costs and to lags in production.

Cover-All* Goggle Style CC60

Wearing comfort, more than anything else, will move safety goggles off the forehead on to the eyes. In Cover-All* goggles, as in all WILLSON protective equipment, comfort plays a big part in their design. The large, deep eyecups allow plenty of room for wearing prescription spectacles—and they are molded with rolled edges to fit facial contours around the eyes. The soft, leather bridge adjusts to the correct distance between the eyes and the adjustable headband provides for proper head size.

Don't fail to consider personal comfort if you want eye safety equipment worn as intended.

DAILY REMINDERS

Such as Willson "Blind Man" safety posters keep workers in hundreds of plants aware of the need for personal safety measures. Supplies are available on request

WILLSON
"Established 1870"

WILLSON PRODUCTS, INC., 235 WASHINGTON STREET, READING, PA.

SURPRISE YOURSELF WITH ROTO FINISH SAVINGS!

Use these successful short-cut methods for sizeable savings in finishing metal and other parts.

You will find that Roto-Finish curbs climbing costs by establishing NEW production economies.

Roto-Finish methods, materials, and equipment *mechanize* your finishing operations, putting them on a high-speed, smooth-flowing basis. Roto-Finish eliminates tedious, time-consuming manual procedures to save you money, materials, and manpower. Also, it improves results, maintains exacting quality standards, holds critical tolerance specifications uniformly and reduces rejects.

Versatile, flexible, adaptable Roto-Finish meets a wide range of production-finishing requirements. Want proof? Send us sample parts for processing. Include finished piece as a guide. No obligation.

FOREIGN REPRESENTATIVES

Melbourne, Australia — A. Flavell Pty. Ltd.
London, England — Roto-Finish Ltd., 32 Bishopsgate
Windsor, Canada — F. B. Stevens of Canada Limited
Den Haag, Holland — N.W. Roto-Finish Maatschappij voor Benelux

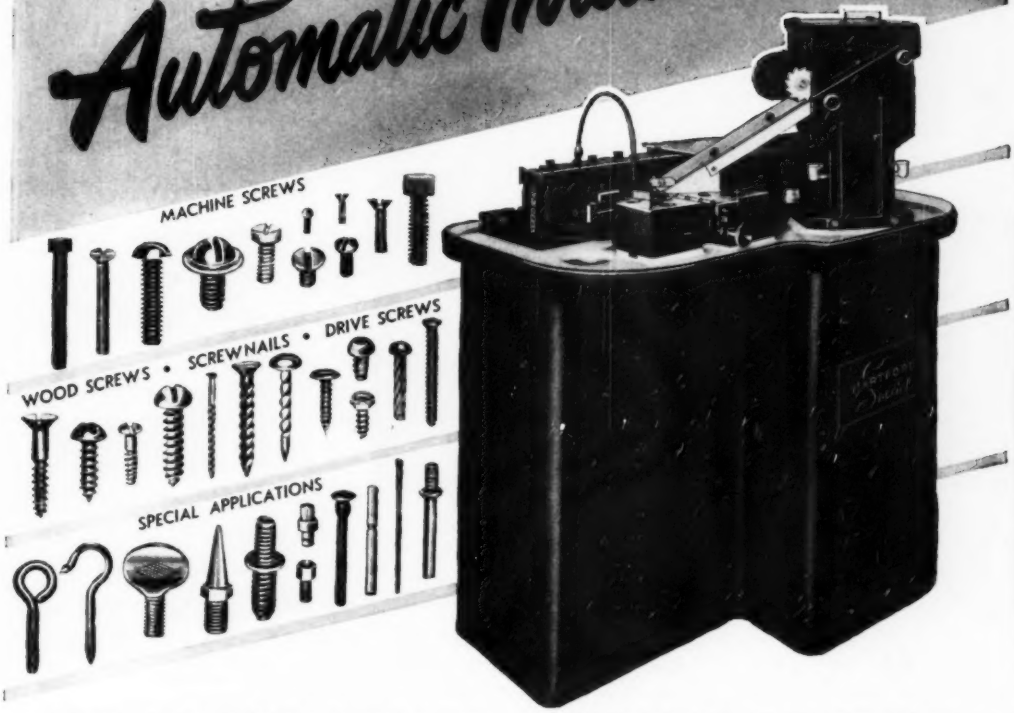
ROTO-FINISH COMPANY
3810 Milham Road, Kalamazoo, Mich.

ROTO-FINISH
ORIGINAL ENGINEERED MECHANICAL FINISHING PROCESSES

LOW COST — HIGH PRODUCTION

HARTFORD *Special*

Automatic Thread Roller



This Automatic Thread Roller is designed to solve standard and special thread rolling problems on small size screws from .086" to .190" in diameter with thread length capacity from ⅛" to 1½", rolling consistently to Class 3 Thread Fit. Careful engineering and rugged construction make it capable of continued high production runs with startling economy.

The "Hartford Special" Automatic Thread Roller incorporates such outstanding features as Completely Automatic Feed, Filtered Lubrication System, "Table Top" Working Level, Vibration-Free Operation, plus many more.

Our engineering staff is always available to help you work out your thread rolling problems. Write now for complete information.

HARTFORD *Special*

Automatic Drilling and Tapping Machinery • Swaging Machines
Die Polishing Machines • Contract Machine Work • Gears • Cams
"Super-Spacers" • "Four-Point" Milling Vises • "V-Block" Milling Fixtures

THE HARTFORD SPECIAL MACHINERY CO.
287 Homestead Ave., Hartford 5, Conn.

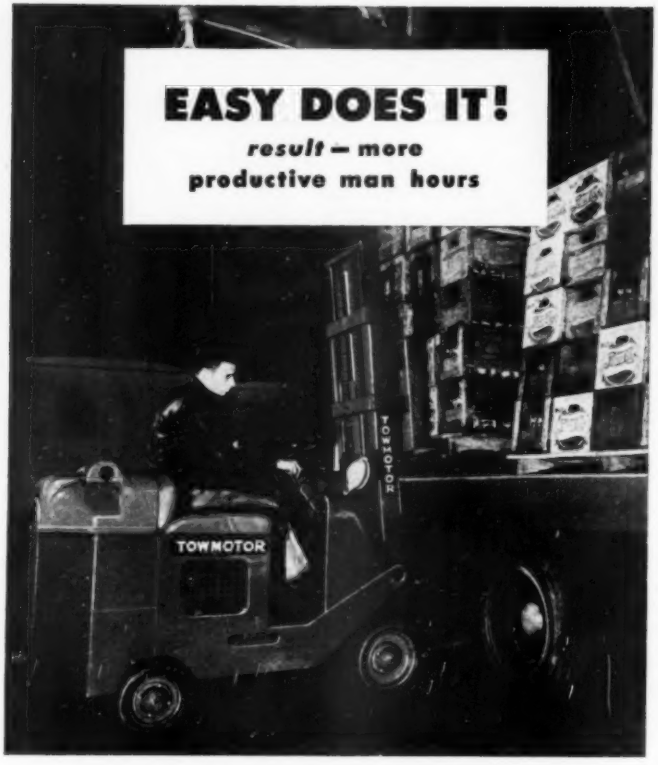
Please send me free Bulletin TR-100 describing your Automatic Thread Roller.

Name _____ Pos. _____

Company _____

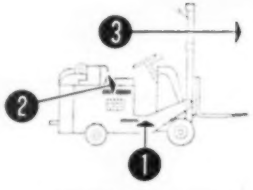
Address _____

1 City _____ Zone _____ State _____



every handling job is easier with

TOWMOTOR MH!



1-LOW STEP-UP 2-WIDE SEAT
3-GOOD VISIBILITY
—Towmotor Efficiency Features

Your driver is seated at his important task . . . with plenty of leg room, seat room and "see" room to do a more efficient, faster, better job.

Another development pioneered by Towmotor is the exclusive design which permits greater freedom and ease of operation for the fork lift truck operator—increasing his alertness and efficiency in the safe handling of loads up to 15,000 lbs. Compare Towmotor with any other lift truck and you will see why Towmotor's outstanding features make every **M**ass **H**andling job easier, faster, safer. Write for a copy of the "Operators Guide." Towmotor Corporation, Div. 56, 1226 E. 152nd St., Cleveland 10, Ohio. Representatives in all Principal Cities in U. S. and Canada.

TOWMOTOR
THE ONE-MAN-GANG

FORK LIFT TRUCKS and TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

How to Use More Color in the Shop for

Employee Efficiency

•

Employee Morale

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Safety

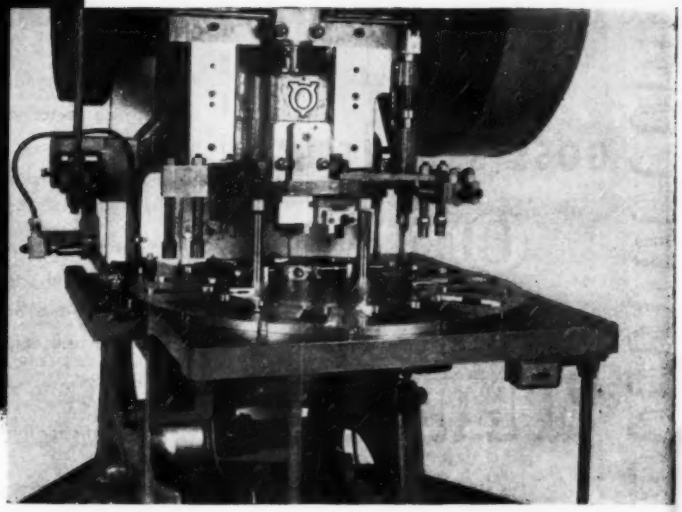
Here is a wealth of practical information on the use of Functional Painting. This Special Report's 16 pages . . . illustrated in full color . . . provide you with valuable data on planned color in the shop as an aid to better production.

Reprints are available at 30 cents each, or 28 cents each in quantities of 100 or more. For a complete list of available reprints, write Reader Service Department.

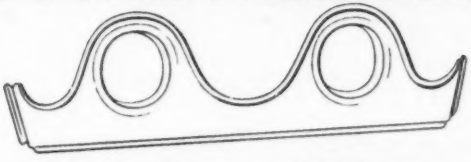
American Machinist

McGRAW-HILL BUILDING
NEW YORK 18, N. Y.

With 3 Operations Combined Into 1...



a V & O Press Produces a Part Like This



The transparent tape dispenser part, shown at left, is produced on a V & O Press—with all operations performed automatically.

At the Rate of 55 Pieces Per Minute!

Ordinarily, it would require 3 different operations to produce the transparent tape dispenser part illustrated.

However, through the use of a V & O Press, equipped with a 16-station dial feed, all 3 necessary operations are **combined into 1!**

At the **first station** of the press, two holes are pierced and flanged, the outside edge is turned and ends are finished formed. The part is then indexed automatically to the **second station** where the recess is formed around the holes and the edge is brought up for the curl. At the **third station** the recess around the holes is set and the outside edge of the part is curled over. The part is ejected automatically. Output is at the rate of 55 pieces per minute!

The press — equipped with micro switch checking devices — stops automatically if more than one blank is fed, or if the part is not properly stripped from the punches. A cam operated safety-stop clutch permits the press to operate only when the dial is in perfect register.

Perhaps the solution to your stamping problem can also be found in V & O Press engineering. Write for details — or better still — let us arrange to have one of our sales engineers call at your convenience.

the V&O PRESS CO.

DIVISION OF ROCKWELL MANUFACTURING CO.

...Hudson, New York

The

GOSS & De LEEUW

ONE TWO THREE

7 spindle tool rotating automatic chucking machine

Four Machine Spindles for boring, turning, facing and reaming operations on one to three ends provide greater and quicker production than any other "chucker" in the machine tool industry

Three Threading Spindles perform from one to three right or left hand single or double threading operations, on one, two or three ends simultaneously, in perfect alignment, at productions from 100 to 500 pieces per hour.

Write for further interesting details

Goss & DeLeeuw
MACHINE COMPANY
KENSINGTON, CONNECTICUT, U.S.A.

* Fluid Power Improves Production

"LOGAN" AIR CONTROL VALVES

79 MODELS
MOST MODELS STOCK DELIVERY

Check these Features!
- BALANCED PISTON DESIGN
- SELF-CLEANING
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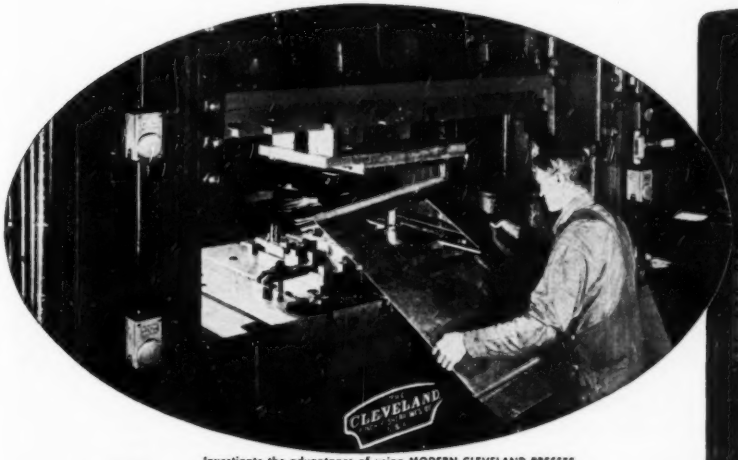

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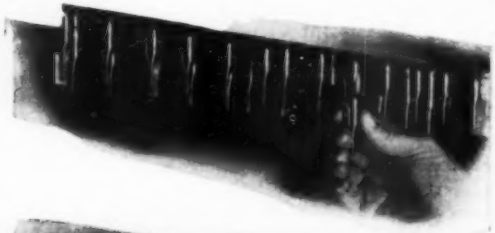

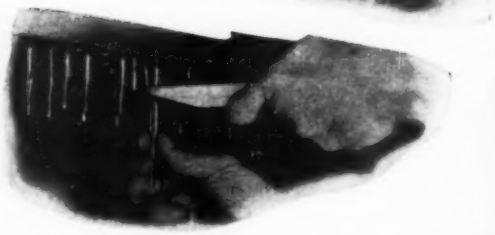

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GRADE	SIZES	Size Tolerances	Sphericity Within
Abbott A	1/16 to 5/8	± .0001	.0001
Abbott B	1/16 to 5/8	± .0002	.0002
Abbott C	1/16 to 5/8	± .0005	.0005
Abbott Hardware	1/16 to 5/8	± .001	.001
Abbott Industrial	1/16 to 5/8	± .002	.002
Abbott Special	1/8 to 5/16	± .003	.003
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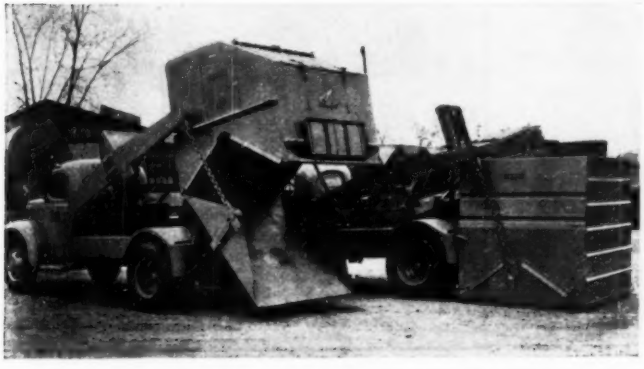

Photo above shows eleven hoisting units recently delivered to the U. S. Navy. Various types of containers are shown in carrying positions. Photo at left shows a hoisting unit preparing to lift a 10 cu. yd. Flat Top container, while another hoisting unit is dumping a 9 cu. yd. Trash and Rubbish Kolector type container. All controls of unit are conveniently located at the driver's seat. One driver and one truck handles any number of containers regardless of types.

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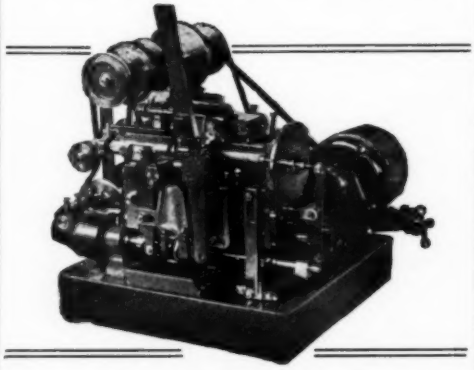

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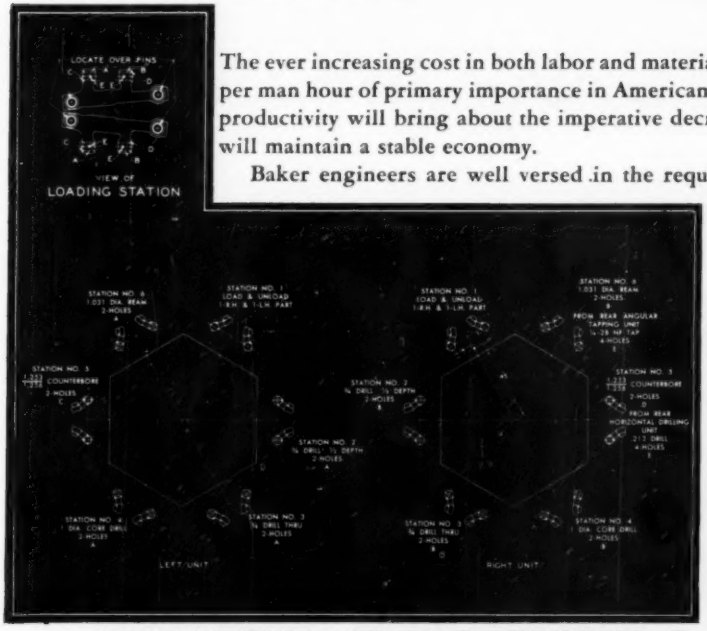

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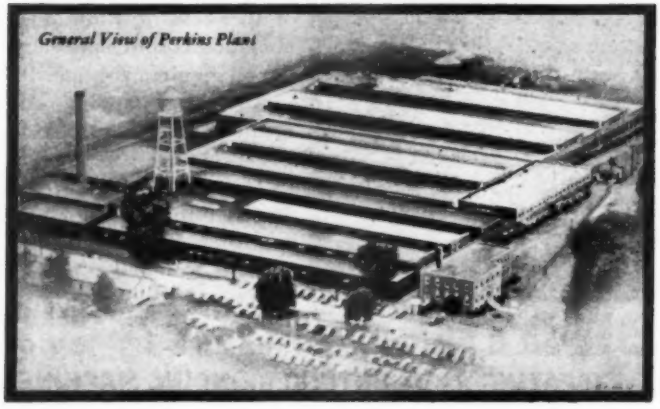

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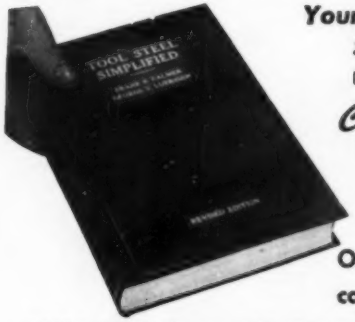

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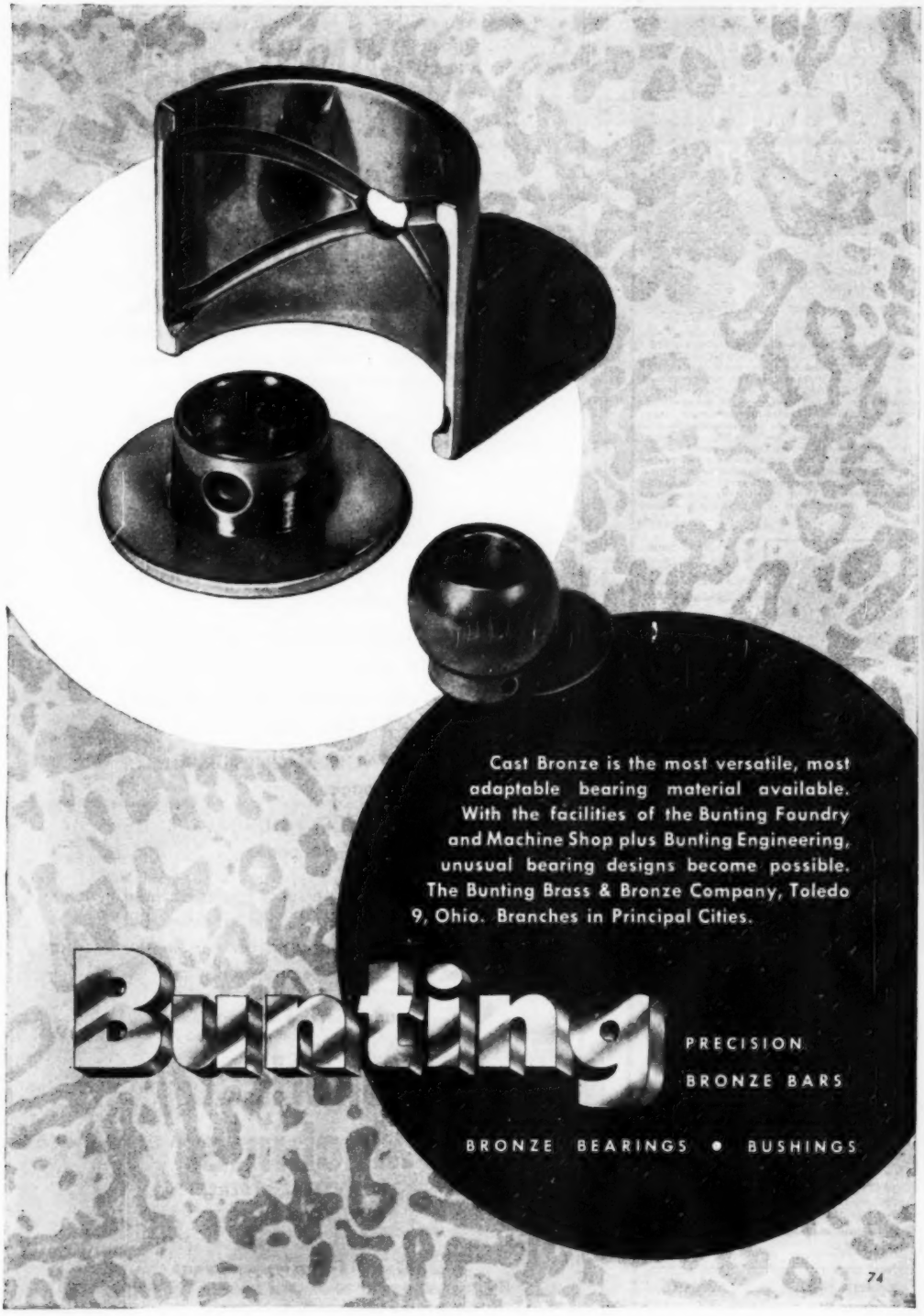
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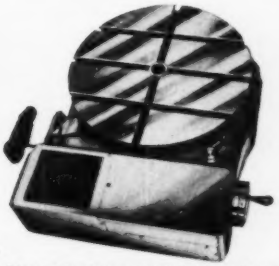

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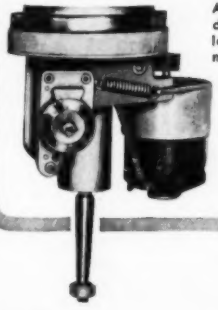

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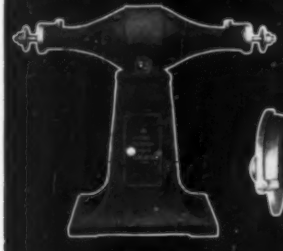

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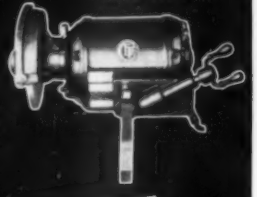

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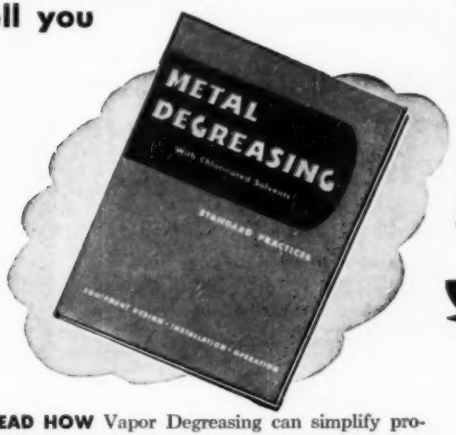

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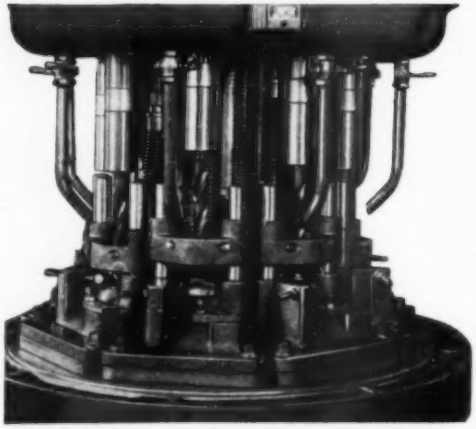

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Two types of bicycle handle bar stems are machined on this Model 8SV vertical drilling machine. The illustration above shows fixture design for holding both types of parts. The hole drilled is 1¼" deep, partially cored, and 1" deep. Parts are drilled at the rate of 960 per hour in a machine with a base only 6 ft. in diameter. Here's why production like this is possible:

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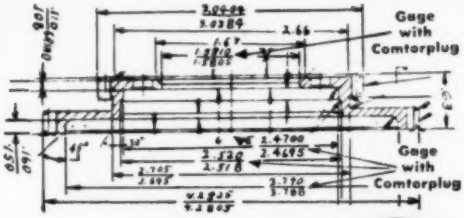

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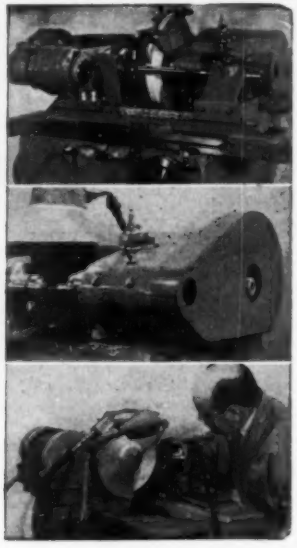

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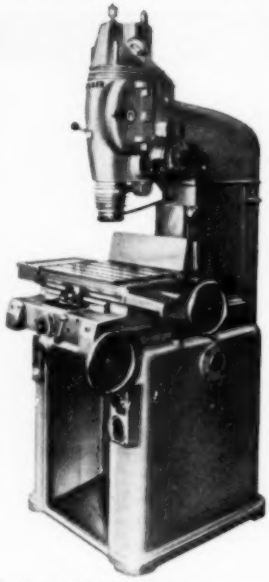

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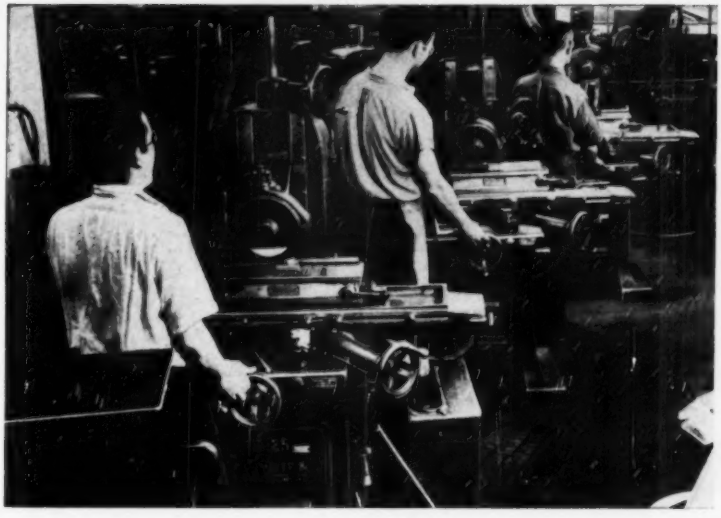

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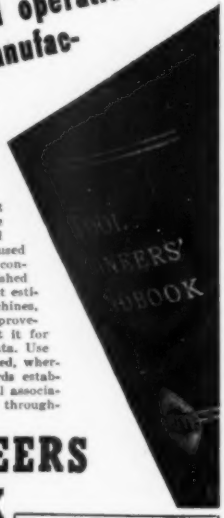

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TOOL ENGINEERS HANDBOOK

American Society of Tool Engineers

Frank W. Wilson, Editor-in-Chief

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A small selection of highlights selected at random to illustrate the scope of this Handbook:

—Describes types of machines, cutting tools, toolholders, fixtures and operations in precision production boring.
—Includes all new techniques and processes of recognized acceptance including Powder Metallurgy, Investment Casting, Plastic Joining of Materials, etc.
—Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting-tool materials and cutting practices.
—Treats, process-wise, such topics as Plaster Mold Casting, Superfinishing, Rotary Swaging, Sheet and strip cold roll forming, Die Hobbing, etc.
—Covers every phase of metal cutting and machinability.
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Partial Listing of the Handbook's 115 Big Sections which Cover Tool Engineering from A to Z:

- Job Planning and Control
- Small Tools Planning and Control
- General Structure and Properties of Metals
- Properties and Workability of Plastics
- Plastics Forming
- Inspection Equipment and Methods
- Investment Casting
- Milling
- Shrinkage Fits
- Broaching
- Engine Lathes
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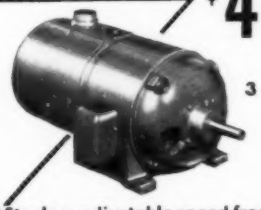

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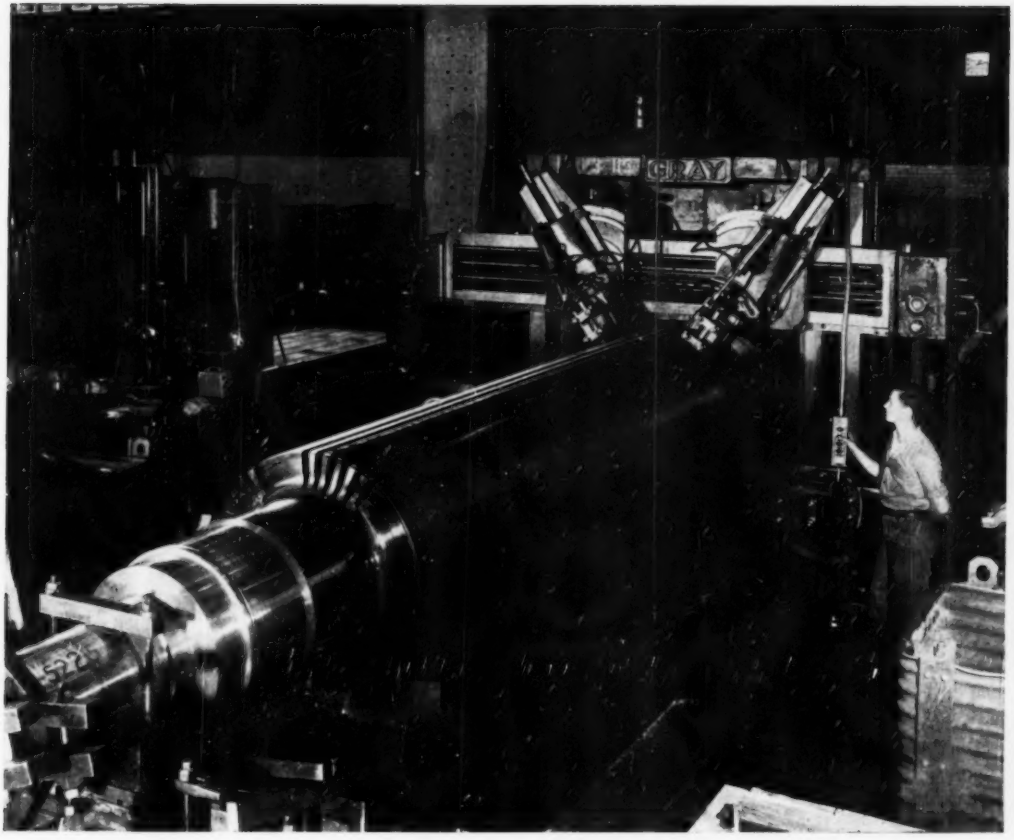

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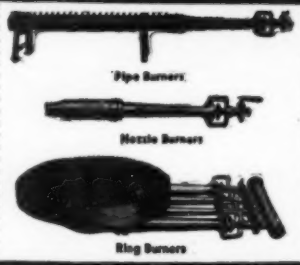

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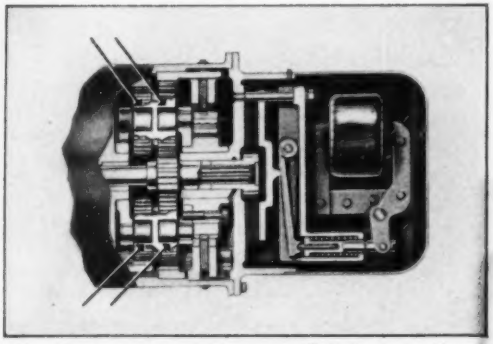

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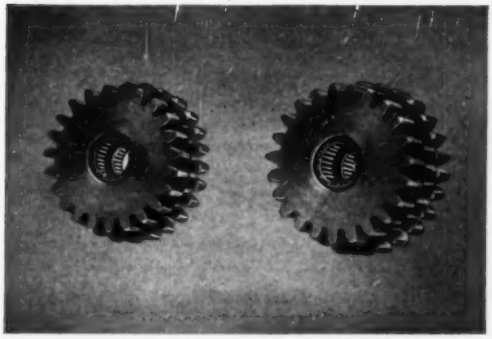

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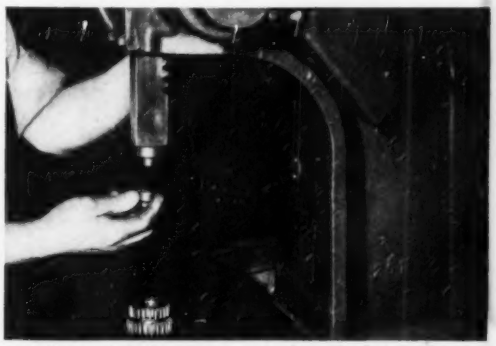

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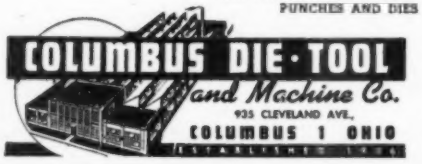

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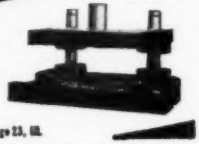

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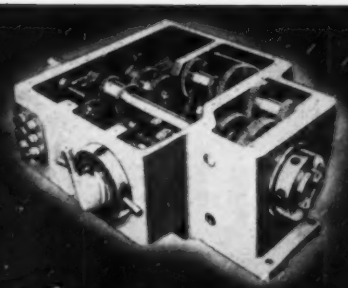

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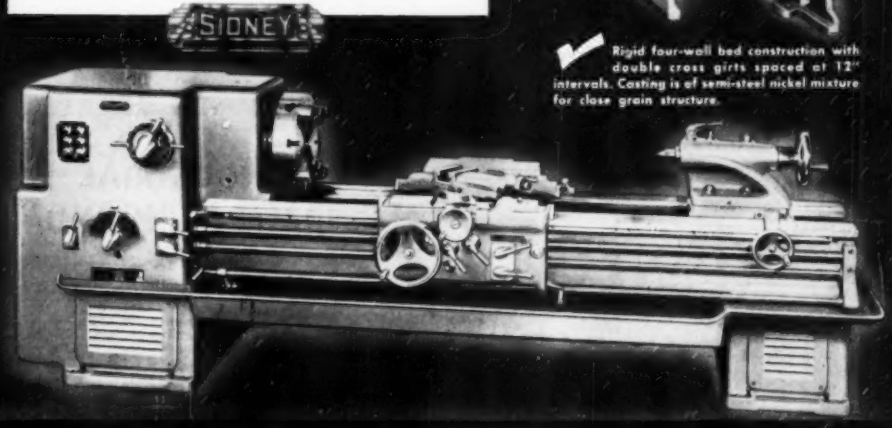

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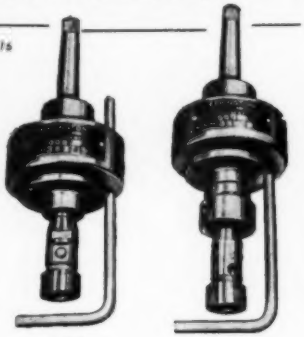

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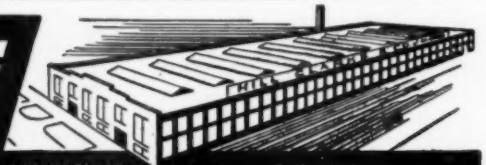

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6"x36" Lees-Bradner—Model HT (1943)
16"x48" Hanson-Whitney Thread (1942)
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller, 4 Hds.
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Micromatic Vertical & Horizontal Hydrohoners
25" Smith & Mills Shaper, M.D.

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, Maxi Service, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

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621 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

UNUSUAL VALUES

Milling Machines—No. 1 Universal. No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 5—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36" Surface 10"x60", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 2"x21"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 7¼" from center of shaft to flatted top (1 h.p. to 15 h.p.; 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" Hi Duty 3" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saw; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88, Columbus 16, Ohio

McDONALD USED MACHINERY

Colburn 62" Hvy. Duty Vertical Boring Mill
G & L and Universal 3" Bar Horiz. Boring Mills
Dreis & Krump 19' Press Brake, No. 14 — Ga. M.D.
Campbell 6" Cap. M.D. Abrasive Cut-Off Mach.
Moline 6-Sp. Hole Hog Drill, Barnes 4-Sp.
29" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Do-All 9 x 24" Horiz. Sp. Hydr. Surface Grinder
Blanchard M.D. Vert. Sp. Surface Grinder 20" chuck
L & S 20" x 8', 18" x 12', 20" x 10', 26" x 12'
Axelson 20" x 12', Hendey 14" x 6', Amer. 17" x 6'
Monarch 20" x 8', Amer. 26" x 12' g-d. hd. q.c.g. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin. No. 3, Mil. No. 2-B & 3-B, Cin. No. 5, LeBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mil. No. 2-B, Cin. No. 1-M, Cin. No. 2, Grd. Hd. Univ. Millers
Cin. 36" M.D. Univ. Shaper, G & E & Amer. 24" Shapers
Cleveland 48" x 12' Table Openside Planer, 3 Hds.

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McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

EXCEPTIONAL BUYS-CLEAN TOOLS

1—#3 BARDONS & OLIVER Universal Turret Lathe, late type, bar and chucking.
1—#SLO 18 x 24 SURFACE COMBUSTION Die Hardening furnace. (Cheap)
1—Only 1830 HONES Die Hardening Furnace. (Cheap)
1—#4 CINCINNATI Universal Horizontal Milling Machine, motorized.
1—VERNON Jig Borer, late type
1—#4 GLEASON Bevel Tester (1945)
1—MAGNAFLUX Tester (Cheap)
2—20" Rotary Tables (K-T)
1—#7 FELLOWS Gear Shaper.

New Machinery in Stock

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Niagara 10' x 16 Ga. Power Squaring Shear, Serial No. 39586, practically new.
Price $2,500.00

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Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
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Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

National Machinery Exchange
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American Hole Wizard Radial 6'x15"
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Pratt & Whitney #2 Jig Borer
Van Norman Universal Miller #22L

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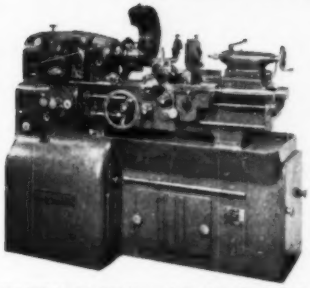


10"x20" Model #EE Monarch Precision Toolmakers Lathe. Late Type. W/Taper Attach. Collets, chucks, toolholders, tool cabinet. Immediate shipment.

TURRET LATHES

Bardons & Oliver #1 Electric Turret Lathe. ¾" cap. Has bar feed & collets.
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw, Machine 1½" cap.
W-Swasey #4 Univ. 1½" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.
Warner & Swasey #1A Universal Heavy Duty Saddle Type Turret Lathe. Serial #648220. Capacity—2½" rd., Grd. Hd. 12 speeds. Coolant system, bar feed, chuck & tooling. Immediate delivery. Excellent condition. Hydraulic Speed Selector.

Walsh O.B.I. Punch Presses, 6 tons to 38 tons capacity. Excellent condition. 220/440 volts, motors & controls. W/counters & blow-off Equipment. IMMEDIATE SHIPMENT FROM STOCK.

ENGINE LATHES

LeBlond 36"x30' Q.C.G. Hvy. Duty Geared Head Screw Cutting Engine Lathe. Serial #NK-230. 12 Speed Head. 36" internal grd. faceplate, Taper Attachment, Dial Thrdg. Set of toolholders. Max Swing—39". Centers—22'6". 25 h.p. 3/60/220/440 volts V-belt drive.
24"x16' American Q.C.G. Motorized Cone Head. 11' centers. Taper Attachment 24" chuck, faceplates, cabinet type legs. 220/440 volts motor
.0"x10' American, Q.C.G. 72" centers.
20"x10' Hendey Motorized.
20"x8' Lodge & Shipley. Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment.
18"x8' Lodge & Shipley, geared head.
18"x6' American, Geared Head, M.D.
18"x6' Monarch 8-Speed hd. Q.C.G. 220 volts motor. Actual swing—20¼". 20" c.c. Hex. Turret on crosslide. Cabinet legs.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Monarch 8-Speed Hd. Q.C.G. 220 volts motor. 24" c.c. Univ. Chuck, Draw-bar & set of 16th collets and 32nd collets.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachments, Chucks, Collets & Quick Acting Collet Chuck.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, Chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, Collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48" Completely rebuilt. Immediate shipment.

BETTS 100" Special Vertical Boring and Turning Mill. 1944 Machine. 2 Plain Heads. Complete electrical equipment. Excellent condition. Immediate delivery.

LATE TYPE GRINDER

1—#5 Brown & Sharpe cylindrical grinder. Size 3" x 12", 220/440v. motors, also motor driven cooler, swivel table, two wheel speeds, four work speeds, six table speeds. Equipped with automatic sizing feature. *Excellent condition.*

GRINDING MACHINES

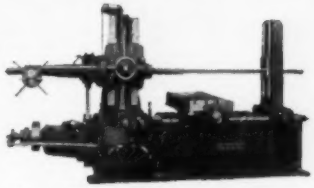
Blanchard #16 Motor Driven Vertical Rotary Surface Grinder. 26" Chuck with power down feed to head. Built-in coolant system.
Cincinnati 10"x36" Plain Hydraulic Cylindrical Model #EA. Serial #5P2D1L-19. Filmatic Bearings. Built-in Electrics. Hydraulic Infeed.
Heald #22 & #25, 12" & 16" Horizontal Rotary Surface Grinders. Motor driven.
Cincinnati 'Monoset' Model #OE Cutter & Tool Grinder, Motor driven. With motors & controls. Set of collets, taper & cylindrical and equipment.
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto, down-feed to head. Motor driven exhauster unit.
Gallmeyer & Livingston #4 Motor Driven Universal Tool & Cutter Grinder. W/Internal Attach. & Thrd. Chaser & Equipment. Motor driven coolant.
Norton 6x18 Vertical Rotary Automatic Surface Grinders. 220/440 volts motors. Excello Spindles. Hydraulic Table feeds. Three Available with immediate delivery. Also 6x18 Horizontal.

AUTOMATICS

#OG & #00 Brown & Sharpe Automatic.
#2G Brown & Sharpe Standard Speed. 220/440 volts motor & push button controls. Complete coolant, turret tooling, collet & collet chuck, toolblocks. FOUR AVAILABLE—FROM STOCK.
#2 Brown & Sharpe Automatic Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears. FOUR AVAILABLE.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system. 1943.

PUNCH PRESSES

O.B.I. Johnson (NEW) all sizes, geared & plain.
O.B.I. Federal #3, 26 tons cap. motor dr.
O.B.I. Toledo #5, 44 tons cap. motor dr.
O.B.I. Bliss #18, 19C, 20, 20B, 21 motorized.
O.B.I. Michigan, 36 tons cap. Wide ram & bed.



Lucas #31, 3" Bar, Horiz. Boring Mill. #5 Morse taper. Motorized, 220/440 volts. All geared speeds and feeds.

Geared S.S.S.A. Bliss #305 Motor driven.
Wheel Press, Niles, B & Pond Horiz. Hydraulic. 200 tons cap. 48" between strain bars.
Stamping, Ferracute #86 Wide Frame, 61½" between housings. 1¾" stroke. Motor driven.
Transfer, Nilson 56 tons S.S. Dble. Crank 3-Dic.
BLISS—Consolidated #77 Open Back Gap Frame Back Geared, 160 Tons Cap. M.D.

BORING MILLS

2½" bar Cleveland Horiz.
3⅛" bar Giddings & L. Horiz.
5" bar Barrett #2 Cylinder.
8" bar Barrett #6 Cylinder.
Ryerson #11 Horiz. 3" Capacity, #6 M.T.
24" Bullard Vertical, Motorized.
42" Bullard Vertical, Motorized.
54" Bullard Vertical, Motorized
42" Gisholt Vertical, Motorized.
60" Betts Vertical, Motorized.

MILLING MACHINES

Cincinnati #3, #4, #5 Pl. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal.
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain.
Milwaukee #2K Vertical, M. Dr. Dial Type.
Milwaukee #3K Vertical, M. Dr. Dial Type.
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal.
#3 Dial Type, H.S. Cincinnati Vertical Mill. Power Rapid Traverse, speeds up to 1300 r.p.m. Range—34"x16"x16" Head has 6" vertical with four stop indicator. Serial #4A3V1L-61. Timken Bearing. 10 h.p. motor drive in base.

UNIVERSAL MILLING MACHINES

LeBlond #4 Hvy. Duty. 40x10x14 M. Dr.
Model #2L Cincinnati Universal. Serial #9A2U1J —102.15 speeds, 12 feeds. 220 volts motor in base.
Index #40H, 16"x8½"x16".
B & S #2, 20"x5"x17½".
B & S #1½, 20"x7"x18".
Bridgeport, 20'x9'x16" Turret Type.
Garvin #2MU, 24"x8"x18".
K & T "Milwaukee" #2, 28"x10"x17".
Kempsmith #2, 28"x8½"x18".
Cincinnati #2, 28"x10"x18".
Cincinnati #2M, 28"x10"x18".
B & S #3, 34"x10"x21".
Cincinnati #3S 34"x12"x20".
Some w/index heads & equipment.

RADIAL DRILLS

Cinci-Bickford 6' Arm, 15" Col. 24 Speeds.
Cinci-Bickford 5' Arm, 13" Col. 24 speeds.
Fosdick 5' Arm, 14" Col. Hvy. Duty, Motorized.
American 4' Arm, 11" Col. Motor on arm.
Cinci-Bickford 3' Arm, 9" Col. 12 Speeds.

BIG MONEY SAVING VALUES IN LATE MODEL MACHINE TOOLS

AUTOMATICS
Consomatic 1⅞", 6 spindle
Cleveland, Model AA-66

BORING MILLS
Cleveland #1, 2½" bar, MD (Horiz.)
Bullard New Era, 24", Side Head, MD
King 34", one rail head, MD
Niles 36-44 Vert. Turret Side head MD
Bullard Maxi Mill 54", two rail heads, MD
DeBlanc #6 Horiz. 4½", MD
DeBlanc #25A, Latest Type

LATHES—ENGINE & PRODUCTION

Lodge & Shipley 14"x30" centers, late type

American 16"x78" centers, Pacemaker
American 14"xx—14"xx', 3 SCD, BG, Bowl Head
American 16"xx—16"xx', 3 SCD, D.B.G.
American 16"xx—16"xx' GH, MD
American 18"xx—18"x8"—18"x10' GH, MD
American 18"xx'—18"x10' 3 SCD, DBG, Bowl Hd.

American 42"x16' bed Internal Face Plate Drive GH Engine Lathe

Boye & Emmes 16"x6' SCEL
Boye & Emmes 18"x8' SCEL
Boye & Emmes 20"x10' SCEL
Boye & Emmes 24"x16' HD, GH
Boye & Emmes 20"x16' QCG, MD
Hendey 14"x6' Model EBM, Tool Room, MD
Hendey 14"x6' 4 SCD, Yoke head
Hendey 18"x8' 4 SCD, Yoke Head, Tool Room
LeBlond 14"x6'—14"x8' 4 SCD, BG
LeBlond 14"x6' GH, MD, BG
LeBlond 17"x6'—17"x8' GH, MD
LeBlond 17"x8' 3 SCD, HI Duty, DBG
LeBlond 21"x8'—21"x10' MD, 3 SCD, DBG
LeBlond 25"x16' bed H.D. Screw Cutting Engine Lathe
Monarch 14"x6' 3 SCD, DBG
Monarch 16"x6'—16"x8' GH, MD
Read Prentice 16"x8' GH, MD
Sebastian 16"x8' 4 SCD
Lodge & Shipley 16"x6'—16"x8' Selective GH, MD
Lodge & Shipley 18"x8'—18"x16' Selective GH, MD
Lodge & Shipley 36"x26' Patent Head Lathe, SCEL
Lodge & Shipley 18"x8'—18"x10' 3 SCD, DBG
Schuemacher & Boye Screw Cutting Engine Lathe, 36"x36'

American 24"x12', 2 speed GH, SCEL
American 24"x12', 6 speed GH, SCEL
American 24"x16', GH, SCEL, MD
American 30"x20' GH, SCEL, MD
Lodge & Shipley 24"x14', SCEL, 3 SCD, DBG
LeBlond 25"x12' HD, QC, SPD, SCEL
LeBlond 25"x16', HD, 3 SCD, SCEL
Niles Timesaver 30"x10' (First Class Cond.)
Lodge & Shipley 36"x26', Patent Head, SCEL

GEAR CUTTERS
Gleason 3" Bevel Gear Generator, SPD
Gleason 6" Bevel Gear Generator SPD
Gleason 15" Spiral Bevel Gear Generator
Barber Coleman Model S for Precision Gears
Fellows #615 Helical Spur Gears MD
Gould & Eberhardt 36" S Automatic Gear Cutter
Gould & Eberhardt 18 H Gear Hobber, MD
Brown & Sharpe 26", 36", 48" and 60", SPD
Cross, #1 Gear Tooth Rounder

GRINDERS—ALL TYPES
Landis 4"x12" Type H, Plain Cyl.
Landis 10"x24" Type C Hyd. Univ., Latest
Landis 12"x72" Plain Cyl., M.D.
Landis 16"x72" Plain Cyl. Self Contained, MD
Landis 20"x220" Plain Cyl. Self Contained, MD
Landis Chaser Grinder, model Y MD
Norton 10"x24" Type BA Plain Cyl. MD
Cincinnati 12"x48" Plain Cyl., MD
Brown & Sharpe #2 Univ., Belt Drive
Rivett 104-2, Internal MD
Cincinnati No. 3 Centerless
Gardner #120 A 51 Opposed Wheel Grinder Latest Type
Pratt & Whitney 10" Spiral Gear, 2 Wheel type
Thompson 6"x18", 6"x24" Type F Hyd. Surface
Norton 6"x18" Surface Grinder, MD

LATHES—TURRET
Warner & Swasey #1A Saddle Type, late type
Gisholt #3 Universal Ram Type, 1942
Warner & Swasey #3 Univ. Ram Type, Timken Bearing
Warner & Swasey #3A
Gisholt #4 Univ. Ram Type, Late Type
J & L 7A Univ. Saddle Type, Late type

SHAPERS & SLOTTERS
Smith Mills 15" single pulley drive GB
Gould & Eberhardt 16", 20", 24" V ram, Cone drive BG
Gould & Eberhardt 16" Univ. MD
Cincinnati 18", 24" Bash Geared, Cone Drive
Gould & Eberhardt 24" M.D. thru Gear Box
Gould & Eberhardt 28" High Duty BG
American 3½" 10" col. Triple Purpose Plain
American 5" 14" col. Triple Purpose Plain
American 7" 17" col. Triple Purpose

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Cincinnati Machinery Co., Inc.
219 East Second Street
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A FEW "SELECT" TOOLS
FROM OUR STOCK OF LATE TYPE MACHINES

Hanchett Model 300 12"x48" Vertical Spindle Surface Grinder—New in 1943—25 HP motor in Head—Excellent condition—Today's replacement cost over $13,000.00

DRILLS
CANEDY-OTTO 21" Box Column Upright—Coolant
LELAND-GIFFORD #1LMS 6-spindle—Coolant
LELAND-GIFFORD #2LMS Single Spindle—P.F.

GRINDERS
CINCINNATI #2 Centerless—"Filmatic"
LANDIS #4H (4"x12") Hyd. Plain-Plunge Cut
NORTON 6"x18" Type C Hyd. Plain
NORTON 12"x36" Type C Hyd. Universal
SELLERS #6T Wet Tool Grinder

MISCELLANEOUS
FOSTER Superfinisher
LAPOINTE #3L Horizontal Hydraulic Broach
LEES-BRADNER #40 Thread Miller
PRATT & WHITNEY #12B 2-spindle Profiler
WOODWARD 48x48x12" Double Housing Planer 3 heads

TURRET & ENGINE LATHES
GISHOLT #3R Saddle Type Turret—Chucking
GISHOLT #5 Ram Type Universal—Chucking
J&L #5 Ram Type Universal—Chucking
BRIDGEFORD 36"x7' centers Geared Head Eng.
CARROLL-JAMIESON 15"x6' Geared Head Engine
LODGE & SHIPLEY 14"x30" Sel. Head Engine
MONARCH 14"x54" Model CAA Engine
WARNER & SWASEY #2 Elec. Head—Bar

MILLING MACHINES
CINCINNATI #1-18 Plain Automatic
CINCINNATI #2-24 Rise & Fall Production
CINCINNATI #2 Hi-Speed Vertical—P.F. to Head
K&T #2K Vertical—P.F. to Head
K&T #3H Vertical—P.F. to Head
K&T #2K Plain Horizontal
K&T #4H Plain Horizontal

MANY TOOLS NOT LISTED

UNITED MACHINERY & TOOL CORP.
85 CENTRAL STREET **WORCESTER 8, MASS.**

LATEST TYPE—*Nearly new*
MACHINE TOOLS

BORING MILLS—Horizontal
CINCINNATI GILBERT 8¼" bar, floor type, latest
GIDDINGS & LEWIS #45, 5" Bar Table Type, latest
LUCAS #41, 3" bar, Table Type, "Precision", Latest
NILES-BEMENT-POND 6" bar, Floor type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical
BULLARD 8' 8 Spin. Mult-Au-Matic, Type J, latest
BULLARD 12' 6 Spin. Mult-Au-Matic, Type D, latest
BULLARD 16' 6 Spin. Mult-Au-Matic, Type D, latest
BULLARD 24", 36", 42" "Spiral Drive," Latest Type
COLBURN 72", 3 Swivel Heads, PRT, Motor Drive
NILES 100" 2 swivel heads, PRT, D.C., Motor Dr.

DRILLS—Miscellaneous
AMERICAN 4' arm 11" col., "Hole Wizard", Latest
CINCINNATI BICKFORD 24" Box Col., Latest
LELAND & GIFFORD #2 LMS 6 spindle, Latest
NATCO 4 AL 20 spindle, Multiple, Latest Type
PRATT & WHITNEY 1⅛x56" Deep Hole, Latest

GEAR CUTTING EQUIPMENT
FELLOWS #61, #7, #7A, #12, #75, #17, #2, #01A, #62G, High Speed Gear Shapers, latest type
GLEASON 3", 12" straight bevel generator, Latest
GLEASON 37" Bevel Gear Planer, Motor Drive
GOULD & EBERHARDT 12H, 12Hs Hobber, Latest
GOULD & EBERHARDT 96H, Hobber, with diff., m.d.
SYKES 21½, 18" Cap., Herringbone Gear, M.D.

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #13 Univ. Cutter & Tool, Latest
BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
LANDIS 6x12, Type H Plain Hyd., Latest Type
NORTON 6x18", 10x72", 14x36", Type C, Plain, latest
NORTON 6"x36", 16"x36", type C, Pl. Hyd., latest

GRINDERS—Miscellaneous
BARBER COLMAN #3, 6, bob sharpener, latest type
BRYANT #16-CP-16, #24 Int. Hyd., latest type
CINCINNATI #3 Centerless "Filmatic," latest type
HEALD 72A3, 72AS "Gagematic," Internal, Latest
HEALD 73A, 72A3, 72AS, 74, 74A Internal, latest
LANDIS #13 Centerless, Hydraulic, Latest Type

GRINDERS—Surface
BLANCHARD #11, 10" chuck, Latest Type
HANCHETT Series 300, 12"x48" Vert. Sp. Hy. Latest
HEALD 25-A—Rotary—16" and 30" chuck, hyd., latest
THOMPSON 12x12x24 Type B Hyd., Latest Type

LATHES—Engine & Mfg.
AMERICAN 36"x360" centers, 2 carriages, motor dr.
LEHMANN 16x30" centers, TIMKEN, latest type
MEDART #6LSF Bar Turner, 1" to 6" Cap. Latest
MONARCH 10"x20" centers, Model EE Timken, latest
MONARCH 12"x30" Centers, 12"x54" Centers, Model CK, Timken Bearing, Latest Type
MONARCH 22"x456" centers, 3 carriage, Timken Bearing, Model CM, motor drive
NILES 30x50" Boring, Timesaver" Timken, latest
PRATT & WHITNEY 14"x54" Centers, 16"x30" Centers, Model C, Timken Bearing, Latest Type
SPRINGFIELD 16"x36" centers, Timken, latest type

LATHES—Turret
HARNDEN & OLIVER #5, #7, Timken, Latest Type
FOSTER #4FU "Fastermatic" Timken, Latest Type
GISHOLT #1L, #2L, #3L, Universal, Timken, Latest
GISHOLT #5, #6, Univ. TIMKEN, Latest Type
JONES & LAMSON #2, #5 Univ., Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
WARNER & SWASEY #2, 3, Ram—Timken, latest
WARNER & SWASEY #2A Universal, Latest Type
WARNER & SWASEY #4A Universal, Timken, Bar and Chucking. (New 1947)

MILLING MACHINES—Plain
BROWN & SHARPE 2B, 3B, Timken, Latest Type
CINCINNATI 6B Auto., rise and fall, latest type
CINCINNATI 4-36, 2-18 Hydromatic, Simplex, latest
KEARNEY & TRECKER 1218, 1404, Latest type
KEARNEY & TRECKER 2H, 3H, 4H, Timken, latest

MILLING MACHINES—Thread
LEES BRADNER 12"x54", Model HT, Latest Type
MOREY 12"x30" and 60" centers, Latest Type
PRATT & WHITNEY 6x60", Model C, Latest Type

MILLING MACHINES—Universal
BROWN & SHARPE 2A, 3A, Timken, Latest Type
KEARNEY & TRECKER 2H, Timken, Latest
VAN NORMAN #12, #26, #36, Timken, latest

MILLING MACHINES—Vertical
BROWN & SHARPE #2B Timken, High Speed
CINCINNATI #3, Dial Type, Timken, latest type
GORTON #8½D, 9J, high speed, latest type
KEARNEY & TRECKER #3H, Timken, latest type

PLANERS
BETTS (CONSOLIDATED) 108"x84"x50', 4 heads, Rapid Traverse, Box Table, D.C. motor drive
BETTS (CONSOLIDATED) 84"x92"x16', 4 heads, Rapid Traverse, Box Table, D.C. motor drive
NILES "Time Saver" 42"x42"x14', 3 heads, Rapid Traverse, A.C. vari-voltage drive, Latest
NILES "Time Saver" 48"x48"x12', 3 heads, Rapid Traverse, D.C. reversing motor drive

SCREW MACHINES—Automatic
CONOMATIC 2⅝"—4 spindle, High Speed, Latest
GOSS & DeLEEUW 8" auto. Chucker, 5 spin., Latest
GOSS & DeLEEUW 6"x⅝" Auto. Chucker, Latest

MISCELLANEOUS
BARNES #172, 206H, 307, 307B Vertical Hone, Hydraulic, Self-Oiling, Latest Type
CINCINNATI 1-30, 3-30, Duplex Vert. Surface Broach, Double ram, Model FH, Hyd., Latest Type
HENRY & WRIGHT 50 ton Dieing Press, M.D.
KEARNEY & TRECKER Model A Autometric Jig Borer, Latest Type
MICHIGAN 1708, 1712 Universal Reliever, Latest
PRATT & WHITNEY (KELLER), Type BL-3416 & Type G Copying, latest type, 2 & 3 Dimensional

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LATE TYPE MACHINE TOOLS

AUTOMATICS
6" RPA-8 Acme-Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. '41.
1⅝" Greenlee, 6 spindle. 1942.
⅝" RA-6 Acme-Gridley. 1942.
No. 60 New Britain, 1" cap. 1943.

BORING MACHINES
No. 42 Lucas Horizontal. 1940.
No. 54 Excello Double End. 1940.
No. 46B Heald Single End. 1940.

DRILLS
3'9" Cincinnati-Bickford Radial. 1946.
25" Fosdick "Economax". 1941.
W-6 Baush Hyd. Mult. Spdl. 1943.
No. 40 Fox Multiple Spdl. 1944.

GEAR EQUIPMENT
3" & 12" Gleason Generators. 1941.
No. 6 & 17 Gleason Testers. 1943.
12" Red Ring Internal Shaver. Late.
No. GCL-3 Red Ring Shaver. 1942.
No. 624A3 Fellows Side Trimmer. New.
No. 615A & 61A Fellows Shapers. 1943.
No. 7125A & 712 Fellows Shaper. 1943.
Vinco Spline & Gear Grinder. 1942.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain. 1942.
12"x48" Cincinnati Univ. 1943.
10"x72" Landis Plain. 1942.
10"x18" Norton Plain. 1942.

GRINDERS, INTERNAL
No. 74 Heald Ext. Bridge. 1941.
No. 72A3 & A5 Heald Plain. 1944.
No. 5 & 16A22 Bryant. Latest.

GRINDERS, SURFACE
14"x36" P&W Vertical. 1938.
No. 22 & 25A Heald Rotary. 1943.
No. 2—1 Reid, 6"x18" cap. 1940.

LATHES, ENGINE
45"x192" Axelson. 1942.
28"x276" Bertram. 1942.
24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.

LATHES, PRODUCTION
Gisholt "Simplimatic". 1943.
No. 3A L&S "Duomatic". 1943.
No. 2FU Foster "Fastermatic". 1943.
20"x97¾" LeBlond Rapid Prod. 1941.
8"x108" Lo-Swing Semi. Auto. 1942.
Model 8, 10 & 12 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.

LATHES, TURRET
36" Bullard Vertical. 1943.
No. 2A & 3A Warner & Swasey. 1943.
No. 1 & 81⅛"x24" Acme Univ. 1943.
No. 3L Gisholt. 1941.
No. 2, 3, 4 & 5 Warner & Swasey. 1943.
No. 2, 3, 5 & 7 Bardons & Oliver. 1942.

MILLS, PLAIN
No. 5 Cincinnati. 1943.
No. 4H & 4K Milwaukee. 1943.
No. 3 Van Norman. 1942.
No. 2HL Milwaukee. 1942.

MILLS, PRODUCTION
BL-2420 P&W "Keller", 3 sp. 1942.
BL-2416 P&W "Keller", 1 sp. 1943.
BG-1 Keller, single spdl.
No. 1848 Kearney & Trecker. 1942.
No. 1248 Kearney & Trecker. 1942.
No. 1-18 & 2-18 Cincinnati. 1942.

MILLS, THREAD
6"x60" Pratt & Whitney. Latest.
12"x54" Lees Bradner. 1943.
8"x16" Hanson Whitney. Late.

MILLS, UNIVERSAL
No. 2MH Cincinnati. 1942.
No. 2H Milwaukee. 1942.
No. 2SU & 26SU Van Norman. 1942.

MILLS, VERTICAL
No. 3B P&W Univ. Die Sinker. 1943.
No. 3H & 3K Milwaukee. 1942.
No. 2 & 3 Cincinnati. 1941.
No. 2K Milwaukee. 1942.

PRESSES
No. 40-5½ Minster. 1946.
100 Ton Hannifin, Hyd. 1942.
75-ton Bliss Hydraulic—60" stroke. Latest.
45 Ton Reliance. 1942.

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AUTOMATICS
Brown & Sharpe #00G, H.S., #4, #6
Conomatic 8 sp. 1⅞" cap., 6SP—2⅜" cap.
New Britain Gridley 6I—8 Sp. 2¼"

BORING MILLS
Giddings & Lewis #6, #25T, Bullard, 42" V.T.L.
Universal 3" horiz., Lucas #31 horiz.

DRILLS AND RADIALS
Amer. 4'-13" col. Radial, Canedy-Otto 3'-9" col.
Carlton 8'-19" col., Foote-Burt 6 Sp.
Cinci-Bickford Super-Service 21", 24"
Natco Model E-5 Multi-Spindle, 14 spindles
Sibley 24—28", Allen 6 Sp., Excelsior 21"

ENGRAVERS
Gorton #3U, 3Z, 3L; Deckel GI, GIF
Gorton Cutter Grinders 375-2, 265-5

GEAR EQUIPMENT
Fellows #72, 725 High Speed, Mikron Gear Hobber
Michigan, Gleason, Fellows Checkers
Gleason #2 Surface Hardener

GRINDERS—Miscellaneous
Brown & Sharpe #5 cyl., 3"x18", Black Diamond
Brown & Sharpe #1, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic
Cincinnati Universal Filmatic, 12"x30", 12"x48"
Covel #9IA Uiv. Tool & Cutter
Gardner #220, 30" disc. Heald #1 Tool
K. O. Lee Tool & Cutter, Hammond #4 Carbide
Landis #4H Cyl. 4x12", #6 Thread, Landis Centerless
Norton #2 Tool & Cutter, Porter Cable Belt WG8
Norton Cyl. 6x30" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #RG, Greeby Int.

GRINDERS—Surface
Abrasive #1½" Wet, #34 Vertical, #33
Atlantic 6x18" Power Feed, Foote-Burt Hammond
Blanchard #18—42" Chuck #11
Brown & Sharpe #2
G. & L. #18, 6x18" Hand Feed, #25, #35 Hyd.
Hanchett #300, 13x48", Mattison 14x16x48 Hyd.
Norton 6x18" Hyd., Pratt & Whitney 12x36" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES
Bradford 16"x6', Hardinge Precision 9", cabinet
Hendey G. H. 16x30 with relieving att.
LeBlond Regal 10"x31½", 15x30", 19x48", 21x60"
Lodge & Shipley 16x78" T.A., LeBlond HD 16x33"
Monarch 10"x20" EE, 16x78" T.A., 12x30" CKK
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x3½', 13x36", 10" Cabinet
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet

LATHES—Turret
Acme #6W Bar and Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, #2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck 2L
Jones & Lamson #8A Univ., Hardinge ESM
Oster #601 Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3, #4, #5, #4A—6" Bar Cap.

MILLS—Plain & Universal
Brown & Sharpe #2B Pl., #2A Univ.
Cincinnati #3 Plain, 2MH Univ.
Milwaukee #2HL, 2H, Plain, #2HL, 2H, Univ.
Van Norman #12, 20, 22L, 36

MILLS—Vertical—JIG BORERS
Brown & Sharpe #2 Index, Vernon, Bridgeport
Cincinnati #4 Jackson
Gorton #8D, 9J Plain, #8½D Duplicator
Kearney & Trecker #5H, 3H High Speed
P&W 1½B Jig Borer, Sip Jig Borer #MP-5
Moore Jig Grinder, Verson jig borer
Morey #12M ProMer 2 sp.—Pratt & Whitney 12B

MILLS—Production
Brown & Sharpe #000, 12, 2I
Cincinnati #1-12, 1-18, 2-18 Mfg.
Nichols Hand, U.S. MM 1, Kent Owens #1V
Sundstrand #00 Rigidmills, U. S. Duplex

PRESSES
Bliss #8 Dbl. Crank, Bed 42x100", 250 Ton
Bliss #675, 645B, 650 Hi-Production, 304A, 305A S.S.
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #58 OB. Gap Frame #62, 62A, 162
Henry & Wright 25, 75 Ton Dieing
Reliance 45 ton O.B.I.
Thomas 7A, 80 Ton O.B.I., Geo. Flex Elec. Screw
V. & O. #25B O.B.I., #102 Reducing, #6 O.B.I. Zeh and Hanneman 30 tons

MISCELLANEOUS
BAND SAW: DoAll #ML, DoAll Metalmaster, Tannewitz #36M
BENDING ROLL: Buffalo #0, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
HACKSAW: Marvel #6A Automatic, #6, #4B
HONER: Micromatic #H-1 Hydrohoner, Sunnen
IRONWORKER: Buffalo 25U x 20 Univ.
KEYSEATER: Mitts & Merrill, Baker, Davis, Burr
PRESS BRAKE: #253, #335 Chicago
RIVET HAMMERS: Hi Speed, all sizes, Chic. Pneu.
ROUTER: Onsrud #W240, #55 Oliver
SHAPER: 32" G. & E. Universal
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
VERTICAL SHAPER: 6" Pratt & Whitney
WELDERS SPOT & SEAM: Solaky, Taylor Winfield
WRAPPING ROLL: Buffalo #½

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen	Stroke	Opening
500 Ton	Lake Erie	35x36"	36"	68"
600	Bald. G'thw'k	76x36"	22"	30"
500 D.A.	H.P.M.	30x36"	24"	30"
1000	French Oil	53x42"	20"	50"
300	Brand New Watson Stillman Hobbing Press			
375 D.A.	Elmes	84x44"	12"	42"
350	Verson	40x40	36"	72"
50	Dennison	22x20	18	23
150	Southwark	34x30	30 2' to 4'	

UP MOVING RAM PRESSES
50 & 100 Ton Stokes Molding Presses & Pumps
300 Ton Dunning & Boschert Molding Press
500, 800 Ton Waterbury-Farrel 3 & 4 Rod Presses
300 Ton Watson Stillman Press, 24x20" Platens
400 & 500 Ton Shaft Straighteners—Self Contained

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LATHES

16x36 Lodge & Shipley Geared Head Lathe, 12 spindle speeds, 16 to 485 RPM, self contained, AC Motor Drive
16x108 Sebastian Geared Head Engine Lathe, 8 spindle speeds, 14 to 350 RPM, Grinding Attachment, AC, MD, Serial No. 1001833
24x90 LeBlond Engine Lathe, Face Tapering, Quick Change Attch.
16"x10' Lodge & Shipley Geared Head Motorized Lathe, Serial No. 29436
16"x8' LeBlond Engine Lathe
16" Lodge & Shipley Geared Head Lathe, Motorized
16"x10' LeBlond Engine Lathe, Quick Change
14"x6' Champion Lathe
19"x8' LeBlond Quick Change Engine Lathe
32" Greaves - Klusman Engine Lathe
12"x6' LeBlond Engine Lathe, Quick Change
16"x8' LeBlond Engine Lathe, Quick Change
10" Logan Screw Cutting Lathe, Motorized, Serial No. 10460
12"x6' LeBlond Engine Lathe
8" Speed Lathe Motorized
16" Hamilton Lathe
6"x8' LeBlond Engine Lathe, Quick Change

GRINDERS & BUFFERS

Cincinnati No. 2 Cutter & Tool Grinder, Universal Work Head, Head & Tail Stock, Cylindrical Grinder attch., self contained, AC motor drive
Brown & Sharpe No. 14 Cylindrical Grinder 18x5x2
Heald No. 70 Internal Grinder
Disc-Tool Carbaloy Hiloy Grinders, Etc.

TURRET LATHES

Warner & Swasey Universal Turret Lathe equipped for Bar & Chuck work, 2½" bar capacity 17" swing, Preselector Head with 12 Spindle speeds, self-contained, Motor Drive, Serial No. 6035847
Acme 5W Universal Turret Lathe, equipped for bar & chuck work with taper attachment 9 spindle speeds, from 40 to 900 RPM, self contained, Motor Drive, Serial No. 5067.
W & S No. 4 Turret Lathe, Motorized, Serial No. 108220
W & S 2A Turret Lathe, Motorized, Serial No. 113664
2½" Acme Chucking Lathe
2½"x8' LeBlond Auto Lathe
13"x8' Automatic Chasing Lathe
3" Spindle J & L Bar Machine
2½" Spindle J & L Bar Machine
3" Spindle J & L Turret Lathe

MILLING MACHINES

Cincinnati No. 3 Plain Mill Dial Type with Built-in Speed Calculator, Rapid Power Traverse in all directions, all power quick change, feed, and speeds, spindle speed 18 to 1300 RPM, self contained, AC, motor drive, serial No. 4A-3P-1K-38
Lees-Bradner Thread Mill Single Spindle, Model NT-12x56, Rapid Power Traverse, in either direction with 2 speed, motor driven, cutter head, coolant pump and self contained, AC motor, serial No. NT767
No. 2 Cincinnati Universal Milling Machine, Serial No. A-1080-E
Brown & Sharpe No. 3 Universal Mill
Brown & Sharpe No. 13B Face Mill
U. S. Hand Mill

SHAPERS

32" Smith & Mills Shaper, Motorized, AC
20" Special Smith & Mills Shaper, Motorized
25" Smith & Mills Shaper
16" Smith & Mills Shaper

GEAR HOBBERS & CUTTERS

Follows Geared Shaper, Motorized, Model 645, Gear 5" Face Width with Power Rapid Traverse to Table, with take up 35" A. D. Self Contained, 4 speeds, A/C motor drive
No. 12 Barber-Colman Geared Hobber, Serial 1058
24" Becker-Brainard Bevel Gear Cutter
No. 3-26 B & S Automatic Gear Cutter
Rochester Automatic Tool Grinder
Gear Testing Machine

BORING MACHINES, ETC.

No. 999 Van Norman, Grant Perfector Boring Bar, Serial No. 20127P-30
No. 777 Van Norman Perfecter Boring Bar, Serial No. A-2870
16" Double Head LeBlond Boring Lathe
No. 5 Tapered Horizontal Boring Lathe

FACTORY EQUIPMENT

Metal Stock Bins
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Factory Trucks
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Fire Extinguishers
Job Clocks
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Asstr. Size Chain Hoists
Portable Crane
Vises
Metal Tool Trays
Metal Benches, Etc.
Platform Scales
Metal Shelving
Benches & Stools, Etc.

PLANERS

52x54x22' Gray Planer, 2 Head on Rail and 2 Side Heads
36x44x12' Widened Gray Planer, 4 Heads, 2 Side, 2 Heads on Rail
33x44x10' Widened Gray Planer, 4 Heads, 2 Side Heads, 2 Heads on Rail
36x36x14' Gray Planer, 2 Heads on Rail
36x36x8' Gray Planer, 2 Heads on Rail
32x32x10' Gray Planer, 2 Heads on Rail
28x26x10' Gray Planer, 2 Heads on Rail
24x24x7' Gray Planer, 1 Head on Rail

RADIAL DRILLS & DRILL PRESSES

5' Carlton, 11" Column Radial Drill with motor on arm and power rapid traverse to arm, 12 spindle speeds from 60 to 1500 RPM, Push Button Control AC M. D., Serial No. 1A-795
4' Drees Radial Press
3' American Radial Drill Press, Motorized
4½" Drees Radial Drill, Motorized
20" Cincinnati Back Geared Drill Press
21" Cincinnati Upright Drill Press, Motorized
25" Foodick Upright, Back Geared Press (Drill)
20" Bickford Back Geared Drill Press
24" Sibley Upright Drill Press, Back Geared
6 Spindle, Avey Sensitive Press
4 Spindle, Handey, Wright Drill Press
Barnes Horizontal Radial Press
16" Canedy Otto Motorized Upright Drill
Canedy Otto Bench Drills
No. 5R Famco Arbor Press
No. 5 Famco Arbor Press
No. 4 Arbor Press
No. 3 Greenerd Press
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SURFACE GRINDERS (Late)

Blanchard #18 Rotary Surface, 30" chuck—1942.

Mattison 24"x18"x96" Hydraulic Hi-Power Precision—generator—chuck—coolant.

Mattison 12"x16"x48" Hydraulic Hi-Power Precision—generator—chuck—coolant.

Farrel 30"x182" M.D. Roll Grinder—30" max., 9" min. Roll—132" max. Face Ground—Quantity of equipment.

MILLERS (Late)

Van Norman #26 Ram Type, Plain—wkg. surf. tbl. 50x12"—30 to 1500-RPM—range 28"x12"x 19"—tooling.

Van Norman #25U Univ. Knee Type—wkg. surf. tbl. 50"x12"—25 to 1250-RPM—range 28"x10"x17"—attch.

Brown & Sharpe #2 Light Type Univ.—wkg. Surf. tbl. 45"x10"—40 to 1300-RPM—range 28"x10"x13"—Vert. Hd.—attchmts.

LATHES

Bridgeford 36"x56', 15-speed Gr. Hd.—3.05 to 150-RPM—38" act. swing—48' C. Dist—Mtzd. Carriage—Rebuilt 1943.

Putnam Heavy Duty 36"x20'6" Triple Bk. Gr.—Quick Change Gr.—Box Type—low bed—center leg—37" act. swing—33 to 367-RPM—13' C. Dist.

Bridgeford 36"x14', 9-speed Gr. Hd.—7 to 108-RPM—38½" Act. swing—84" C. Dist.

BORING MILLS

Universal 4" bar, "Triway" Horiz. Tbl. Type, (late)—added vert range—8 to 300-RPM—face plate to outer support 72"—top tbl. to centerline spdl. 48"—#6 taper.

Defiance #25A—3¾" bar Horiz. Tbl. Type—added vert. & cross range—12 to 1000-RPM—face plate to outer support 98"—top of table to centerline spdl. 48"—#6 Taper.

Niles-Bement-Pond 62" Vert., Standard Pattern—2 swivel hds. on cross rail—M.D.

This Is Only a Partial Listing.

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#4-R GISHOLT SADDLE TYPE TURRET LATHE, SERIAL NO. 2914-37, 9" HOLE IN SPINDLE, Mfg. approx. 1942.

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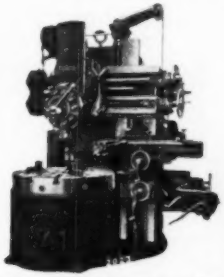

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42" Bullard "SPIRAL DRIVE" Vertical Turret Lathe, at left, with extra high column providing 57" under cross rail. Inspect at Albany.

And . . .

54" Bullard "SPIRAL DRIVE", 4-jaw chuck
42" Bullard "SPIRAL DRIVE", 3-jaw chuck
36" Bullard "SPIRAL DRIVE", 4-jaw chuck
36" Bullard "NEW ERA", 3-jaw chuck
24" Bullard "NEW ERA", 4-jaw chuck
36/44" Niles Vertical Turret, Side Head

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10" x 96" CINCINNATI PLAIN (2) HYDRAULIC GRINDER, FILMATIC BEARINGS (2)

10" x 96" NORTON TYPE C PLAIN HYDRAULIC

21" x 48" LANDIS TYPE D PLAIN HYDRAULIC

YES, THESE MACHINES CAN BE RENTED

#18 BLANCHARDS (2) (1944)

ALSO—

#2 CINCINNATI TOOL & CUTTER GRINDERS

CINCINNATI MONOSET GRINDER

16" x 48" CINCINNATI UNIVERSAL
6"x30" LANDIS TYPE C
16"x72" NORTON TYPE C PLAIN
124-53 GARDNER SURFACE

EMERMAN MACHINERY CORP.

875 W. 120TH STREET *CHICAGO 43, ILLINOIS*

HEADLINERS

LATHES

16"x10' AMERICAN 12-speed Grd. Hd., AC MIB taper
18"x12' LODGE & SHIPLEY Selec. Grd. Hd., AC MD
18"x10' AMERICAN Grd. Hd., AC MD
20"x8' LODGE & SHIPLEY Selec. Grd. Hd., AC MIB taper
22"x10' ROCKFORD 3 SCD DBG bowl hd.
24"x12' BOYE & EMMES, AC Turner Uni-Drive
24"x12' AMERICAN Grd. Hd., AC MD taper
24"x14' LODGE & SHIPLEY, Turner Drive, taper
24"x18' AMERICAN Grd. Hd., AC MD, taper
26"x12' BOYE & EMMES, 3 SCD DBG, QC
30"x16' LODGE & SHIPLEY, Lima Drive, taper

MILLERS

#2 CINCINNATI H.P. Rect. O/A Plain, AC MIB, PRT, Timken
#3 CINCINNATI H.P. Universal, AC MD, div. hds.
#3A BROWN & SHARPE Universal, AC MD, div. hds.
#3B MILWAUKEE DOA Plain, AC MIB, PRT
#4 CINCINNATI H.P. Univ., Lima Drive, div. hd., slot, attach.
#4 CINCINNATI H.P. Rect. O/A Plain, PRT, AC MD
#5 CINCINNATI H.P. Rect. O/A Plain, PRT, AC MD

SHAPERS

16", 20", 24", 28", 32" GOULD & EBERHARDT
24" AMERICAN "Auto Oiled", AC MD
28" AMERICAN Hvy Duty, AC MD
32" CINCINNATI Hvy Duty, AC MD

RADIAL DRILLS

3½' AMERICAN "Triple Purpose", AC mtr on arm
4' MORRIS, Enclosed Head, AC MD
6' CINCINNATI-BICKFORD, mtr on arm
7' DRESES, AC MD

GRINDERS

#3 ABRASIVE Surface, AC MD
#22 HEALD Rotary Surface, new 1943
10"x24" LANDIS Type C Univ. Hydr., new 1943

BORING MILLS

#3A UNIVERSAL Horz. 3" bar, SPD
36" BULLARD "New Era" V.T.L.

GEAR MACHINERY

#6—72" BROWN & SHARPE Gear Cutter, AC MD
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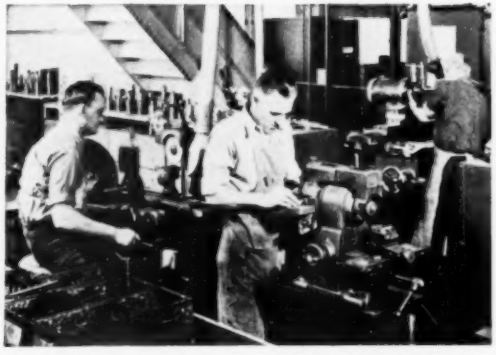
Carboloy "Triple C" Plan pays dividends at New Britain-Gridley

Coordination of carbide tool design and application at New Britain-Gridley, brought about through the "Triple C" Plan, keeps machine down-time at a new low. On this draw-boring application, for example, all carbide-tipped tools are pre-set in cat heads to exact dimensions. For various sized bores, operator merely changes heads on arbor, and has no tool setting to do



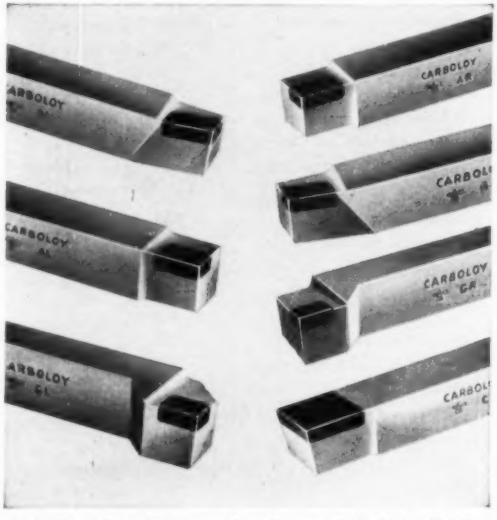
The centralized grinding phase of Carboloy's "Triple C" Plan at New Britain-Gridley resulted in an almost-overnight one-third drop in tool breakage. Carbide-tipped cutting tools are employed on a majority of cutting, facing and boring operations, and have helped lower manufacturing costs, increase production and reduce tool replacement costs.

The New Britain-Gridley Machine Division of the New Britain Machine Co. slashed new tooling costs *by one-third* since the adoption of a plant-wide Coordinated Carbide Control Plan. Read what it has done for them and what it can do for you.

COORDINATION of all phases of carbide tool use within the plant, under the direction of a carbide supervisor, is helping New Britain-Gridley lower its break-even point, a factor of concern to all manufacturers.

Under this unique coordinated carbide control plan, the design, maintenance and application of carbide tools are standardized wherever possible. This standardization, applying to about 95% of all single-point machining operations at New Britain-Gridley, speeds up application of tools on the job, keeps engineering costs at a minimum and simplifies the purchase of cutting tools on an economical, scheduled basis.

Why not investigate and find out how "Triple C" can fit into your production operations . . . bringing you amazing savings in time and costs while increasing your production and profits?



"Triple C" tool standardization allowed over 95% of New Britain-Gridley's turning, boring and facing work to be done by only twenty-nine standard carbide-tipped tools, some of which are shown here.

CARBOLOY COMPANY, INC.

11149 E. 8 Mile Blvd., Detroit 32, Michigan

CARBOLOY®

CEMENTED CARBIDE

THE CARBOLOY "TRIPLE C" PLAN — COORDINATED CARBIDE CONTROL

FOR EVEN GREATER SAVINGS WITH CARBIDES

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THE head is designed to reduce drastically multiple drilling costs by eliminating expensive changes in set-up from job to job.

As much as 90% of the drill head can be left intact, yet a complete engineering change-over is accomplished by simply changing the drill pattern plate and relocating spindles on the new pattern plate to conform to the new design. The number of drill patterns possible with the ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD is limited only by the number of pattern plates available.

The spindle and idler constructions are entirely separate assemblies both being self contained. For this reason, the use of compound gears on the idler shaft gives exactly the tool speed required for a given job. No change of gearing is necessary in the main drive box when tool speed is changed.

THE ADJUSTAFIX MULTIPLE SPINDLE DRILL HEAD can be installed easily on the machines you are now using, and can be used not only for drilling, but for tapping, reaming, spot-facing, boring, counter-boring, and milling operations as desired.

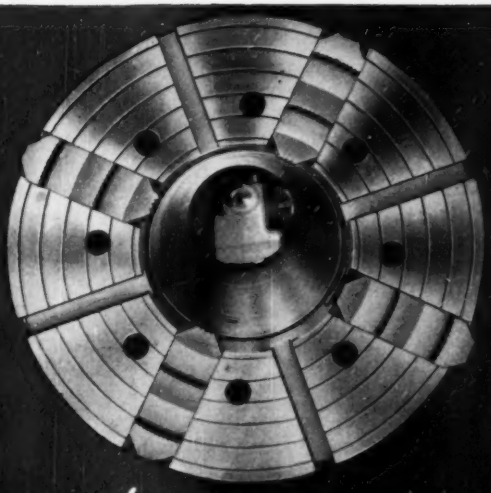
ALL ADJUSTAFIX MULTIPLE heads have fully automatic lubrication for either horizontal or vertical operation.

US HEADS

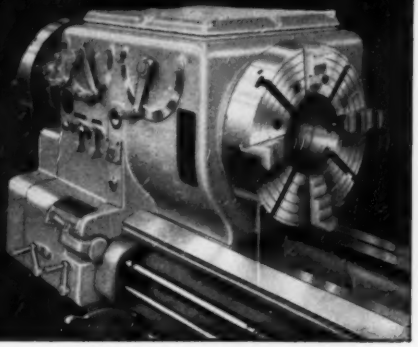
SINCE 1915

UNITED STATES DRILL HEAD CO., 616 BURNS STREET, CINCINNATI 4, OHIO

● We manufacture all types of multiple spindle, fixed center, adjustable and lead screw tapping heads.



You'll feel like awarding a prize



TO THE NEW 20" LeBLOND HOLLOW SPINDLE LATHE

This newest addition to the LeBlond line will qualify for the blue ribbon in the oil country, the steel industry—and any other spot where a 9" opening through spindle, a 27" swing capacity, and an 18-speed geared headstock arranged for 15-hp main drive motor are required. The 20" Hollow Spindle—fourth in a line already including 16", 27" and 30" sizes—will win your approval because it combines simple, economical operation with precision results.

★ SIX MARKS OF MERIT

- Quiet, powerful headstock with 18 geared speed changes.
- Electric Brake with apron spindle start, stop and reverse control.
- Quick-change box offering 63 feed and thread changes.
- Hardened and ground steel bed ways front and rear.
- One-piece apron with positive jaw feed clutch.
- Thrust-lock tailstock.

GET YOUR COPY
of bulletin HS-111 describing the new 20" LeBlond Hollow Spindle Lathe.

THE R. K. LeBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
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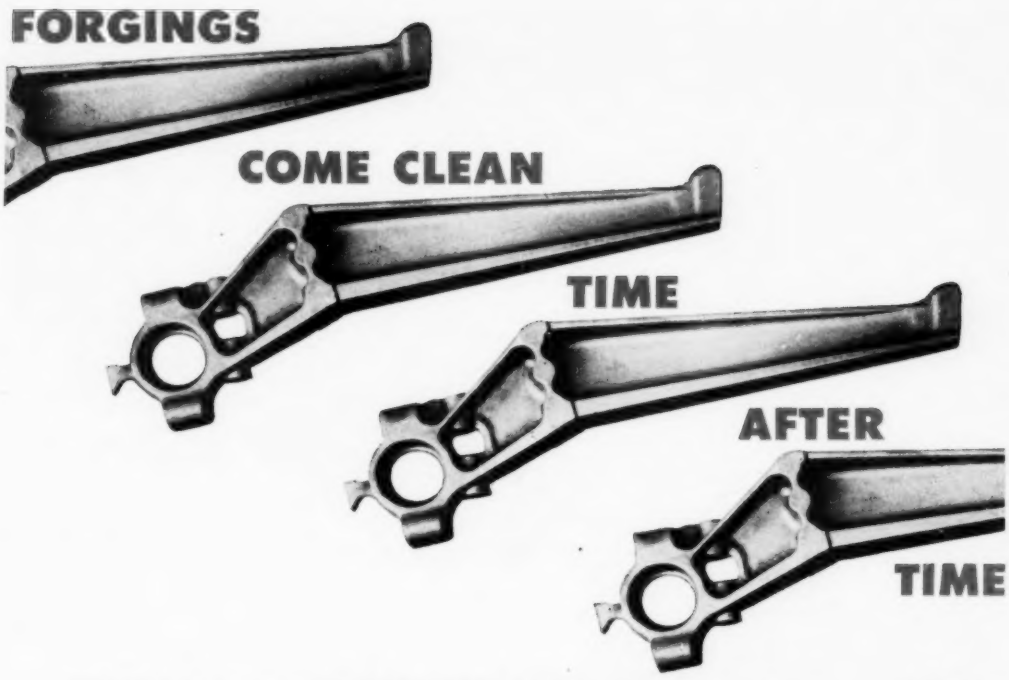

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Timken steels offer uniform behavior in forging, uniform response to heat treatment, and uniform machining qualities. This means that you can standardize shop practices, have fewer delays and rejects, and turn out consistently better products at top production every month!

The uniformity of Timken steel is due to rigid quality control by the most precise methods known. Many of the special practices employed in the Timken plant are only possible in such a large, flexible specialty mill. Into the making of every bar goes the skill and knowledge that comes of years of experience as the world's largest producer of specialty alloy steels.

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